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APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT--ETC(U)
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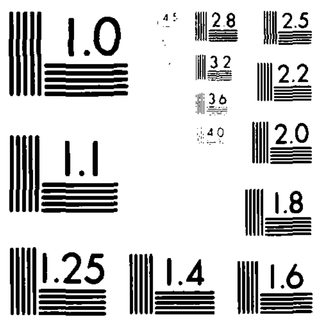

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APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT

Handling & Servicing/Armament Division
Ground Support Equipment Department
Naval Air Engineering Center
Lakehurst, New Jersey 08733

22 MAY 1980

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APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains information relevant to a generator control system to be ~~utilized~~ used in a new DOD Mobile Electric Power Plant (MEP354). An initial study revealed that a microcomputer control strategy was the most suitable system to use for this particular application. A breadboard system was built and tested to see if the controlled power complies with the applicable standard for ground power, MIL-STD-704C. Results obtained indicate that the microcomputer control system will regulate voltage and frequency to the extent called out in the aforementioned military standard.

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SUMMARY

A. **GENERAL**. The military standard pertaining to the quality of power generated by mobile electric ground support equipment presents rigid guidelines to be met. A control system is needed which will meet the goals of this standard with the least parts and costs, while maintaining a very high degree of reliability and maintainability. This report reveals why a microcomputer control system is appropriate and how such a system actually performed in a breadboard situation.

B. **PROCEDURES AND RESULTS**

1. A previous endeavor in the exploratory development area produced a generator that would conform to MIL-STD-704C (NAVAIRENGCEN report number NAEC-92-125). The Franklin Institute Research Laboratories in Philadelphia, Pennsylvania, under contract to NAVAIRENGCEN, completed a study to ascertain the optimum control method for an auxiliary power unit alternator. The report issued, which is included in its entirety as Appendix A, revealed that a microcomputer control system displays the most favorable characteristics of the various systems addressed.

2. A breadboard design of a microcomputer control system was built and tested for conformance to MIL-STD-704C. Results, as displayed graphically in Appendix D, indicate that a microcomputer control system will regulate the electrical characteristics of the particular generator used, as required in MIL-STD-704C. It is recommended that a microcomputer control scheme as exemplified in the report be included in MEP 354.

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I. INTRODUCTION

The performance of electrical and electronic equipment is largely dependent on the quality of power supplied to it. AC devices will perform satisfactorily if the input power is of the specified amplitude and frequency with a limited amount of tolerable distortion. It is essential that these devices receive the expected quality of power. Degradation of performance, abbreviation of service life, inefficient operation, and heating problems all are related to the application of improper input power, whether under steady state or transient operating conditions.

The current military standard which defines the electrical power requirements supplied to the utilization equipment aboard aircraft is MIL-STD-704C. Due to its stringent requirements, the ground support equipment community recognized a need to develop new Mobile Electric Power Plants (MEPPs) which would be able to supply the specified power to aircraft during ground maintenance and preflight checks. MEP 354 is the DOD designation for the new MEPP which will replace two older units, the NC-8A and the NC-2A. This report documents the investigation that led to the selection and testing of a generator control system.

II. BACKGROUND

The Fleet's need for a quality of power as defined in MIL-STD-704C is the driving force behind an effort to build a new Mobile Electric Power Plant, MEP 354. A previous study was made to obtain a generator that was most likely to comply with the new standard. A DOD 30KW diesel-driven generator was obtained due to its favorable electro-mechanical characteristics and availability. A computer program was written to calculate the expected electrical parameters of this generator set. Verification of the computer results was completed through a comprehensive test program as delineated in the appropriate military standard test directive, MIL-STD-705B.

Design changes stemming from the above tests were incorporated in the generator to achieve a generator that complies with MIL-STD-704C.

A later study, which is enclosed as Appendix A, indicated that a standard microcomputer control system would be the most suitable control system for the generator set. The decision was based on several parameters including, ability to meet the voltage regulation requirements, development costs, hardware costs, and operational costs. Based on this conclusion, a standard microcomputer board was obtained (Intel 80/10) and a breadboard control system was set up and tested. The goal of this report is to indicate that such a system works very well. The voltage and frequency characteristics obtained by the breadboard microcomputer system met both the steady-state and transient requirements of MIL-STD-704C.

III. OBJECTIVES

The objective of this effort was to obtain a generator control system which would regulate a generator's output characteristics and meet the new standard for aircraft/ground support power, MIL-STD-704C. Desirable attributes of the control system are simplicity (in terms of the fewest number of parts), reliability, maintainability, and low cost (both initial and life cycle).

IV. APPROACH

Once it was determined that a microcomputer control system exhibited the best characteristics for our application, a standard microcomputer board was obtained. Control algorithms for both voltage and frequency were drawn up. From these algorithms a detailed machine language program was written. Next, the necessary hardware to support the computer program was designed and built into a breadboard system. Finally, the polished system was tested for conformance to MIL-STD-704C.

V. SYSTEM DESCRIPTION

The control algorithms and the theory behind them, software flowcharts, and the actual program listing are included as Appendix B. The supporting hardware, built around an Intel 8080 microprocessor on an 80/10 microcomputer board, is enclosed as Appendix C.

VI. DISCUSSION OF RESULTS

Appendix D gives vivid evidence of the performance of the microcomputer control system for both voltage and frequency. With the diesel-generator set's battery voltage applied to the field and an external resistor of 1.5 ohms placed in series with the field, the voltage regulation characteristics met the transient and steady-state requirements of MIL-STD-704C. Using a 4-cylinder Hercules-White engine and a 15KW Electric Machine generator, a 15 KW, 0.8 power factor load was used to determine the regulator response. Figure D-1 illustrates that the voltage does get back within the steady-state limits in the required time span.

Utilizing the same engine and generator with a Woodward electrohydraulic governor, the frequency response was tested again with a 15KW, 0.8 power factor load (rated load). Figure D-2 displays the frequency control system's response. The frequency stabilizes within the steady-state limits in 2.25 seconds. Clearly, this is well within the allowable 10 seconds from removal or application of load.

It is therefore concluded that the chosen microcomputer control system did effectively regulate the DOD engine-generator set's voltage and frequency response to comply with the specifications of MIL-STD-704C.

VII. CONCLUSIONS AND RECOMMENDATIONS

This program consisted of a comparative study of possible control systems, algorithm and computer program writing, breadboard building and testing, and an evaluation of the final system. Results, depicted graphically in Appendix D and discussed previously, indicated that a microcomputer control system, when used in conjunction with the particular DOD diesel-driven generator set, meets the requirements of MIL-STD-704C.

It is recommended that a microcomputer system be included in the total MEP 354 development package as the AC voltage and frequency control system. It is further recommended that a Woodward type of electrohydraulic governor system be employed on the diesel engine.

A microcomputer is a versatile and powerful tool. The Intel 8080 microprocessor performed very well as the core of the control system. Nevertheless, it has ample capacity to control or monitor other functions besides AC voltage and frequency. Control of DC voltage for a transformer rectifier unit and monitoring of key parameters such as over/under voltage, excessive current draw, oil pressure, water temperature, and other functions could very well be performed by the 8080. At the onset of this program the 8080 was at the vanguard of the industry. However, the electronics industry is progressing at a very rapid rate, particularly in the digital field. Current microprocessors are more powerful and faster, and have a larger supply of peripheral packages to support them than those which existed a few years ago. It would prove worthwhile to incorporate the most advantageous and well-supported microprocessor in MEP 354.

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APPENDICES

APPENDIX A

FEASIBILITY STUDY OF OPTIMUM CONTROL METHODS FOR AUXILIARY POWER UNIT ALTERNATOR

Prepared by:
The Franklin Institute Research Laboratories
Philadelphia, Pennsylvania
Contract No. N68335-75-C-1346
August, 1976

SUMMARY

The objective of the study was the selection of a design strategy for a motor generator controller. The first step was to establish specific design goals. These goals included compliance with MIL-STD-704B, MIL-D-8512 and MIL-T-21200L. The next step was the analysis of the equipment to be controlled--alternators and diesel engines.

Once the goals and restrictions were established, the study of various system design strategies was begun. The major area of investigation was in design techniques to achieve the required voltage regulation. These techniques were divided into three major categories: analog, digital and hybrid. Several methods in each category were evaluated; many through computer simulation. The investigation determined that methods in all three categories could meet the regulation goals.

Having established the feasibility of meeting the voltage regulation goals, the selection of the best strategy to meet the overall goals of the motor generator was made. This selection was based on many factors including: development costs, hardware costs and operational costs. The main conclusion was that the motor generator controller should be based around a standard microcomputer using a saturating control type of regulation.

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ILLUSTRATIONS

ILLUSTRATIONS (Continued)

1. DESIGN GOALS

The general goal of this study was the selection of the optimum design strategy for a motor generator (AC-APU) controller. The controller must meet all specifications and standards for use with motor generator sets rated from 15 KW to 100 KW.

Specifically, the motor generator controller must meet the following military standards and specifications:

MIL-STD-704B	Military Standard, Aircraft Electric Power Characteristics
MIL-D-8512	Military Specification, Design; Special Support Equipment
MIL-T-21200L	Gen. Spec. for Test Equip. for Use with Electronic and Electrical Equipment

This section is a discussion of the AC-APU design goals as they relate to regulation, environment, and general operation. The goals were derived by FIRL from the referenced military standards and specifications, and from discussions with Naval Air Engineering Center personnel.

1.1 REGULATION

The voltage and frequency of the AC-APU must be regulated to the required standards set forth in MIL-STD-704B. These standards require that the voltage not exceed the time envelope profile shown in Figure 1-1, and that the frequency remain within 1.25% except during load transient conditions. These goals are attainable only through use of servo systems in which a reference standard is compared to the variables to be controlled (voltage and frequency) and as a result the error is amplified to a level that will correct the variables. The amount of amplification required is a function of the allowable error. This can be expressed as:

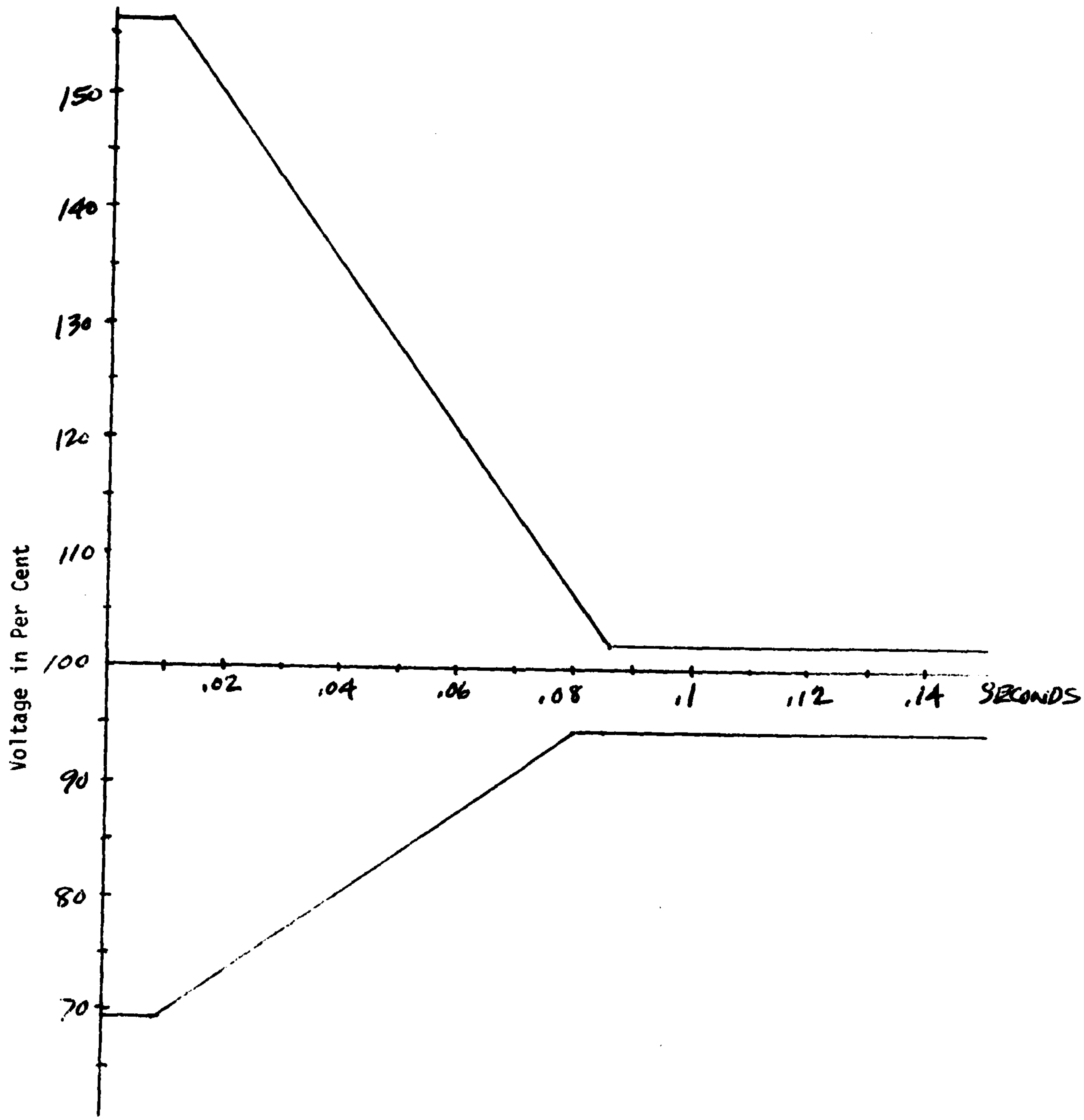


Figure 1-1. Envelope of AC Voltage Surge

$$E = e_r - e_v$$

$$e_v = EG = (e_r - e_v)\,G$$

$$\frac{e_v}{e_r} = \frac{G}{1 + G}$$

For 1% regulation:

$$\frac{99}{100} = \frac{G}{1 + G}$$

$$G = 99$$

1.2 ENVIRONMENTAL GOALS

A summary of the environmental requirements for the motor generator controller follows.

Temperature altitude - See Figure 1-2.

Humidity - Up to 100% humidity, condensing on and in equipment in operating and non-operational modes.

Vibration - Must be capable of withstanding a logarithmetic sweep of 5 to 55 to 5 Hertz (sinewave) in 15 minutes at the following amplitudes:

Frequency Hertz	Double Amplitude
5 to 15	.06 in.
15 to 25	.04 in.
25 to 55	.02 in.

Shock - Must be capable of withstanding 18 shocks of 15g.

General - Must operate effectively under the following conditions: sand, dust, salt, snow, rain, ice.

- Must be mildew resistant
- Must be usable by a person wearing heavy arctic clothing
- Must be shielded against radiated interference.

1.3 OPERATIONAL GOALS

MIL-STD-704B states the specifications of the controller in terms of voltage regulation, frequency regulation, etc. However, a major goal

TEMPERATURE/ALTITUDE

Operating			Non-Operating	
Temperature Extremes °C				
Continuous	Intermittant 20 Min.	Altitude	Temperature Extremes °C	Altitude Maximum
-54 to +55	+71	0 to 10,000 ft. (30.0 to 20.6 in Hg.	-62 to +85	50,000 ft. (3.4 in. Hg)

Figure 1-2. Temperature/Altitude Requirements for Motor Generator Controller

of this study was to insure that the AC-APU will be easy to operate and repair. Therefore, the complete controller will not only control but monitor and diagnose as well.

The regulator portion should:

- Meet all applicable standards and specifications
- Be of simple design
- Be adjustable over a range of output voltage

The goals of the monitor function are as follows:

- The following parameters should be continuously monitored:
  - voltage
  - current
  - frequency
  - speed
  - oil pressure
  - fuel level
  - coolant temperature
- These parameters should be presented to the operator on demand and the appropriate parameters should be automatically

presented when abnormal operation is detected.

- The presentation of information to the operator should be simple to understand. Where possible, this information is to be presented in "GO/NO GO" format.
- Operator actions required to obtain monitored information should be simple.
- The number of displays should be minimized.
- All necessary displays should be located centrally.

The goals of the diagnostic function are as follows:

- The diagnostics should act in conjunction with the monitoring function to detect and control abnormal conditions. Abnormal conditions include:
    - over/under voltage
    - over/under frequency
    - over current
    - over temperature
    - low fuel level
    - low oil pressure
    - low oil level
    - low coolant level
- Ideally, the diagnostics should detect not only absolute faults (e.g. overcurrent) but potential faults (e.g. sharp rise in temperature).
- The diagnostics should minimize operator involvement and be completely automatic.
- The diagnostics should permit total check out of the motor generator set and controller. Ideally, the diagnostics should pin point any faulty electrical or mechanical components and be performed while the AC-APU is in operation.
- Any non-automatic diagnostics should be easy to use.
- Ideally, the total diagnostic feature should be self-contained in the motor generator controller. However, a separate peripheral device to perform detailed diagnostics may be considered if cost, size and operation factors are beneficial.

2. ANALYSIS OF ALTERNATORS

The closed loop system to regulate voltage and frequency of an alternator requires that the characteristics of the alternator be known in terms of time variable expressions. The alternator consists of a field winding used to provide rotor flux and a stator winding that is cut by these lines of flux to provide a sinusoidal voltage whose frequency is determined by the number of pairs of poles and rotor speed. Since each item is critical to the successful design of the control system for the alternator, each was examined separately.

2.1 FIELD WINDING

The field winding has a time variable expression related to the inductance and resistance of the winding. Since current is related to the field flux, the transfer characteristic is desired between current and applied voltage.

$$E = IR + L\frac{dI}{dt}$$

Using the Laplace transform S for d/dt

$$E = IR + SIL$$

$$\frac{I}{E} = \frac{1}{R + SL}$$

The real term in the denominator is R and when the imaginary term (SL) is equal to R, the phase angle will be 45° and the amplitude will decrease to .707 of the D.C. amplitude. The relation of (L/R) is known as the time constant of the system and appears at a frequency determined by

$$f = \frac{1}{2\pi\ (L/R)}$$

2.2 REGULATION

If the alternator had no inherent regulation due to load, there would be no need for the development of a regulator. Unfortunately, every alternator has inherent regulation due to the effective impedance that appears between the generated voltage and the terminal voltage. The amount of regulation varies with machine design and is a measure of decrease in terminal voltage when full load current is drawn from the alternator. The specific design considered in the analog computer simulation has a regulation that is calculated to be between 8 and 10 per cent from no load to full load.

2.3 EXCITER SYSTEM

The field excitation can be derived from a static source such as battery or A.C. rectified. The exciter must provide a D.C. power sufficient to fully saturate the field. Field excitation can also be obtained by use of a generator on the same shaft as the alternator. Some designs use D.C. generators with brushes to pick off the D.C. power which is to be delivered to the field. More recent exciter designs use brushless types of exciters which have no parts that will wear. Such designs therefore are nearly maintenance free. The penalty to be paid for such a design is the effect of an additional time constant that makes the control loop more difficult to stabilize.

2.4 NON-LINEAR OR SATURATION CONSIDERATIONS

The relation of field current to flux developed in the air gap of the alternator is fairly linear over a portion of the operating range. Normally the operating point is placed just beyond the knee of the curve so that when higher flux is needed to overcome the inherent regulation characteristics, the ratio of current to flux is not the same as found under no-load conditions. Since the non-linear transfer characteristic of the field is in the control loop, the loop gain is not constant but varies with load current. At no load the gain is higher than at full load.

Each of these characteristics have been determined in general form so that any alternator design can be simulated by this technique. Parameters have been determined for a specific alternator for this study and the derivation of the parameters are included in Appendix A.

The block diagram representing the alternator is shown in Figure 2-1. E_{ex} is the exciter input voltage. The gain and dynamics of the exciter are represented by K_{ex}/R_{ex} $(L_{ex}/R_{ex}$ $S + 1)$ and the output voltage E_f is the voltage delivered to the main field winding. The dynamics of the main field are represented by $1/R_f(L_f/R_f$ $S + 1)$ with the gain K_f and an output in terms of flux appearing in the alternator air gap.

The voltage gain constant K_e multiplied by rotor speed $S\theta_G$ will develop the generated voltage which through the internal impedance of the rotor represented by the regulating characteristic $R_\ell/(R_G + R_\ell)$ will produce the terminal voltage E_ℓ.

The terminal voltage multiplied by the conductance of the load $1/R_\ell$ will produce the load current I_ℓ. The load current multiplied by the torque constant K_T and scaled by the shaft spring constant, the combination of which is multiplied by the flux $\emptyset$ will produce the generator torque T_G.

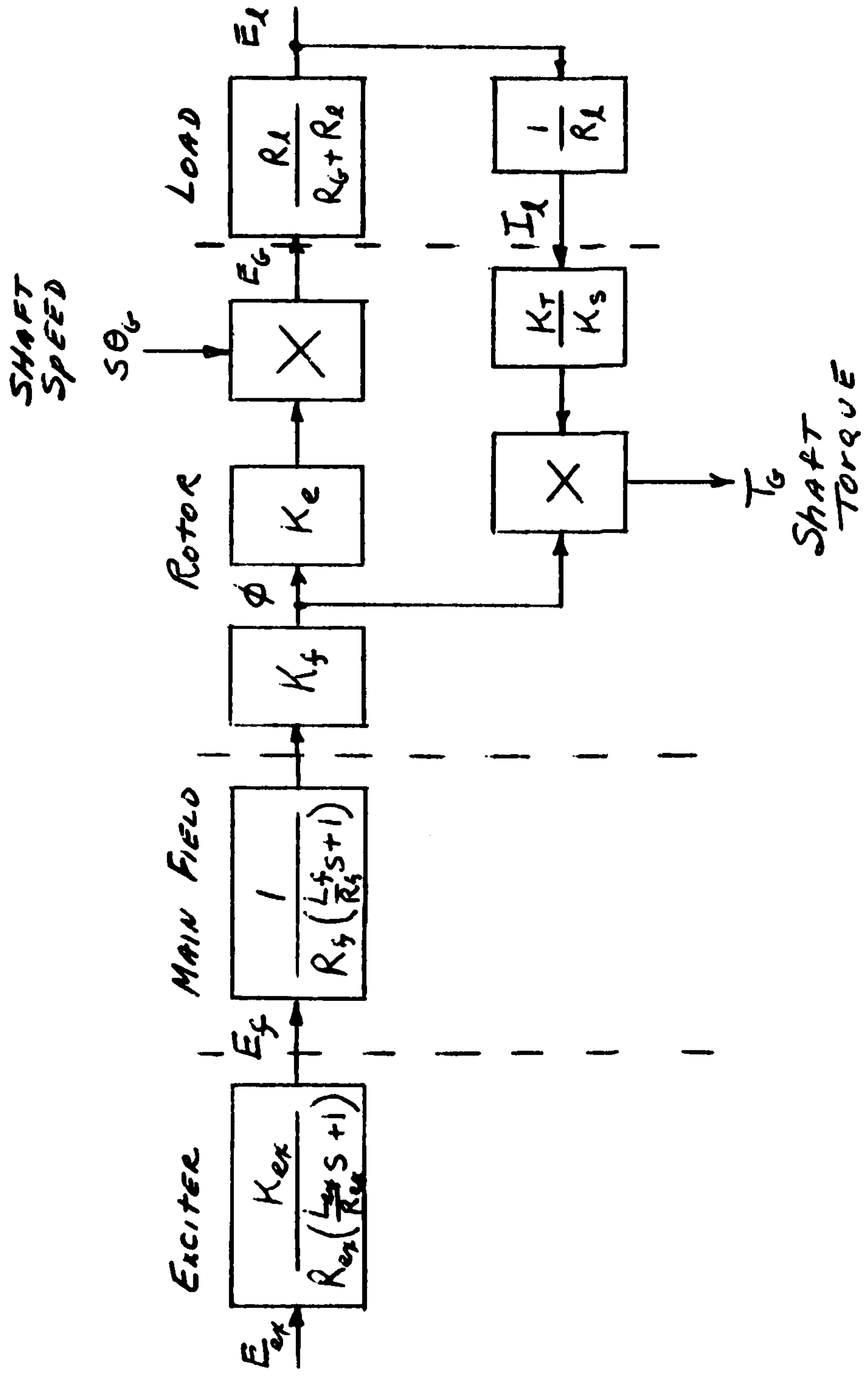


Figure 2-1. Alternator Block Diagram

3. ANALYSIS OF DIESEL ENGINE

The application of a diesel engine to drive an alternator requires far better speed control than that required for a D.C. generator. Since frequency is directly related to shaft speed, the shaft speed should be kept constant regardless of load conditions. As in the analysis of the alternator the closed loop system to regulate speed required that the characteristics of the diesel be known in terms of time variable expressions. Since each item is critical to the successful design of the governor for the engine, they are discussed separately.

3.1 ROTATING INERTIA

The rotating inertia of the system consists of the diesel engine inertia coupled by shaft to the alternator inertia. The shaft has an angular spring rate. The inertia will develop a force due to angular acceleration or rate of change of shaft velocity. The shaft angular spring rate combined with the inertia of the engine and the alternator have a natural frequency that is determined by $\sqrt{\frac{K}{J}}$.

3.2 TORQUE VERSUS FUEL FLOW

The fuel flow system versus developed torque is fairly constant regardless of shaft speed. For the analog computer simulation, it has been considered constant.

3.3 THROTTLE CONTROL

The flow of fuel into the engine must be controlled and in order to maintain constant speed, the throttle opening must be controlled by the error between the speed reference and the actual shaft speed. The time variable element in the throttle system is the moving valve piece. The valve piece has inertia, damping and, in most cases, a spring to return

it to the closed position. Valves that are operated by electrical force coils have a time constant due to the inductance and resistance of the coil.

Each of these characteristics have been determined in general form so that any diesel engine design can be simulated. For this study, parameters have been determined for a specific engine and the derivation of the parameters is included in the appendix.

The block diagram representing the diesel engine is shown in Figure 3-1. The input voltage to the flow control valve is shown as E_γ. This voltage through the coil dynamics $1/R_S(L_SR_S\ S + 1)$ and the mechanical dynamics of the valve represented by $1/[J_T/K_S\ S^2 + K_D/K_S\ S + 1]$ with a gain of $K\ K_{S\gamma}$ will produce a valve displacement represented by X_T. The valve displacement will provide flow of fuel to the diesel engine and a torque T_D will be developed in proportion to the engine gain K_1. The resultant torque applied to the shaft coupling diesel engine to alternator rotor is derived from the developed torque T_D minus the torque due to change of shaft speed through the dynamics of $K_D(J_D/K_S\ S + 1)$. The dynamics of the shaft are represented by $1/K_S(J_D/K_S\ S^2 + K_D/K_S\ S + 1)$. The resultant torque from the shaft when summed with the alternator torque T_G will accelerate the alternator inertia and overcome friction and windage described in the block with gain and dynamics of $K_S/K_D\ (J_G/K_D\ S + 1)$ and an output of shaft speed $S\theta_G$.

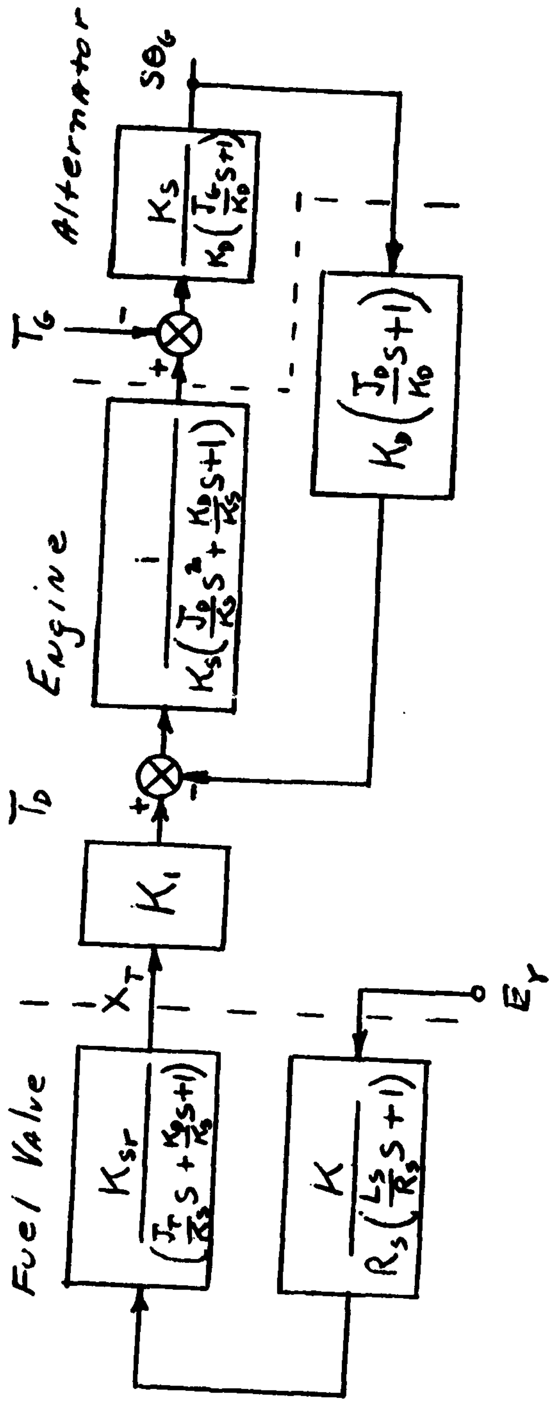


Figure 3-1. Diesel Engine Block Diagram

4. SYSTEM DESIGN STRATEGIES

This section describes the various system design strategies considered for the motor/generator controller and the analysis of calculations and test results.

In order to maintain a reference point, the discussion of the voltage regulator hardware and design trade-offs assumes that a microcomputer will be used for the monitoring and diagnostic functions. A general block diagram of the monitoring and diagnostic system is presented in Figure 4-1. The block diagram is discussed in detail in Section 4.5.3.

4.1 LITERATURE SEARCH AND REVIEW

A computerized literature search was performed to aid in the selection of regulator design strategies. The search retrieved information from three data bases:

Engineering Index
Institute of Electrical Engineers (IEE)
Information Service of Mechanic Engineering (ISMEC)

The results of the computer search are presented as Appendix B.

A review of the data obtained from the computer search and from other sources led to the selection of several regulation methods; these fall into the general categories - digital, analog and hybrid.

4.2 ANALOG METHOD OF CONTROL

The analog method of load voltage control from an alternator requires the use of continuous current. The amplitude of the current must vary in order to control the alternator field. The error voltage, that is the difference between reference voltage and load voltage, is a continuous voltage varying in amplitude. It is amplified to provide the necessary

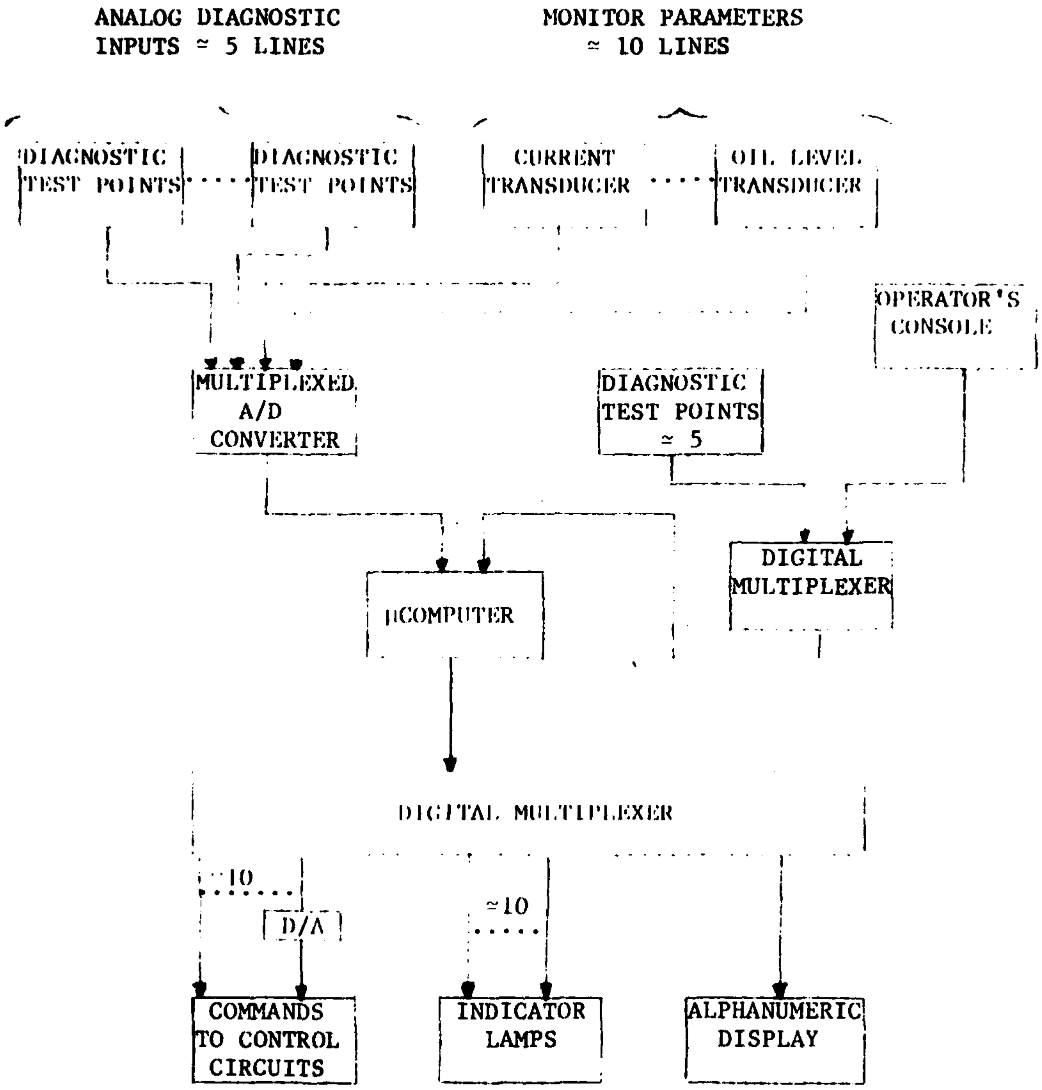


Figure 4.1. General Block Diagram of the Microcomputer Based Monitoring and Diagnostic System

field current needed to hold the load voltage to the required level. The most accurate system for this type of control is a type 1 system. This differs from a type zero system in that a type zero system has an error that is dependent upon loop gain. A type 1 system has an integration so that under static conditions the error is zero.

The complete system of the diesel engine drive, governor, alternator and voltage regulator have been simulated for the analog system. The general form block diagram is shown in Figure 4-2. The description of the symbols and the derivation of their numerical values are given in Appendix A.

Referring to Figure 4-2, the shaft speed of the alternator $S\theta_G$ is the controlled function that is desired to be constant. The speed as compared to the reference $S\theta_V$ will produce an error e_D that may be a mechanical or electrical signal used to drive the throttle valve the distance X_T. Throttle displacement will produce fuel flow which through the gain constant K_1 of the diesel engine will produce an output torque of T_D. This torque will drive the combined inertia of the alternator (J_G) and diesel engine (J_D) through the shaft spring constant (K_S). Since friction and windage (K_D) are present some torque will be required even at constant shaft speed and zero electrical load.

The alternator loop has a load voltage (E_ℓ) compared to a reference voltage (E_r) to provide an error (e) as an input to the voltage regulator. The voltage regulator will drive the exciter field which in turn will drive the main field of the alternator. The field flux ($\emptyset$) developed by the main field excitation will generate a voltage (Eg) that is a product of shaft speed ($S\theta_G$) and field flux ($\emptyset$) through a gain constant (K_e). The load voltage (E_ℓ) will adjust in level in proportion to the load current by virtue of the alternator inherent regulation characteristic.

The load current (I_ℓ) multiplied by the field flux ($\emptyset$) will produce a torque $\left(\frac{K_T\ I_\ell \emptyset}{K_S}\right)$ that will subtract from the shaft torque delivered

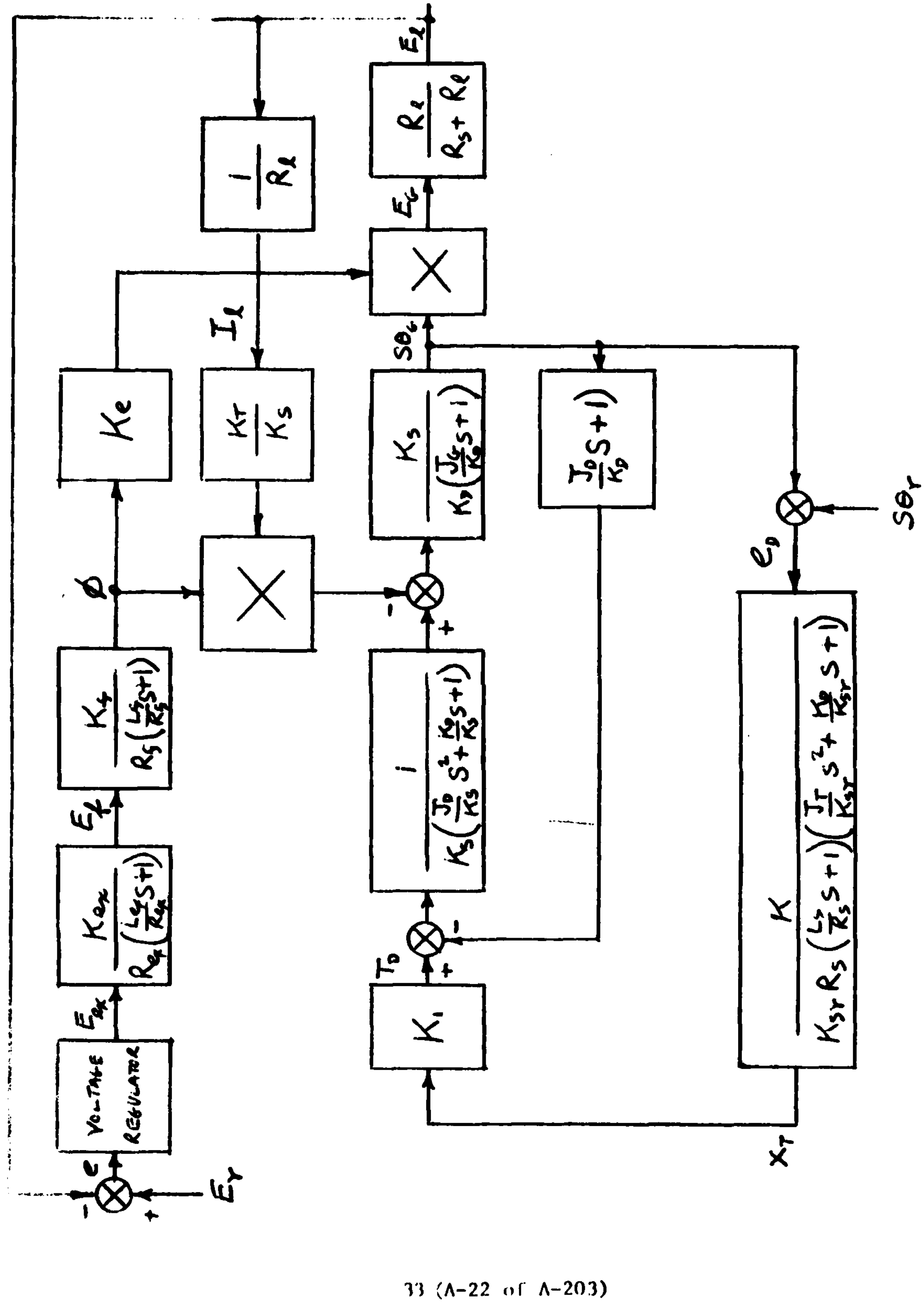


Figure 4-2. Alternator and Diesel Engine Block Diagram

to the alternator inertia thus slowing down the shaft speed.

From this block diagram and the constants derived in the appendix, the analog computer simulation was developed as shown in Figure 4-3. In Figure 4-3 the block designated as governor contains the electronic equivalent of the dynamics of the solenoid operated flow control valve to supply fuel flow to the engine. The input is an electronic voltage $S\theta_Y/100$ which when compared with the tachometer voltage representative of the shaft speed $S\theta_G/100$ will produce the error voltage necessary to produce the input to the diesel engine.

The input to the diesel engine has a non-symmetrical torque limit in which the acceleration torque is twice that of the deceleration. The dynamics of the shaft stiffness and diesel engine inertia are included in the block marked diesel engine. The block marked alternator has the torque input to the alternator dynamics including rotor inertia. Multipliers are used to generate developed torque from load current and field flux and shaft speed multiplied by field flux to develop generated voltage $E_G/10$. A feedback path in the amplifier used to convert $E_G/10$ to $E_\ell/10$ establishes alternator regulation due to load. A second amplifier with a bias input is provided to facilitate a larger scale voltage of the load voltage as designated by $\Delta E_\ell/2$. Regulation and dynamics of the alternator can be more accurately determined using this means of offset or bias level cancelling. The exciter input shown in the exciter block comes from a voltage regulator that has an input from E_ℓ and provides gain and compensation to stabilize the loop. The exciter block contains the gain and dynamics of the exciter used to drive the main field.

Of the many runs that were made, those recorded for the 10% and 15% inherent regulation with and without the compensation needed to bring the transient within the allowable limits of the MIL-STD-704B are discussed in the following paragraphs.

The alternator with 10% inherent regulation is shown in Figure 4-4 with a voltage regulator system of nominal control characteristics. The characteristics include compensating networks that are in the AC voltage regulator design shown in Figure 1-12 of the NAVAIR 19-45-19 report. Using this as a starting point, a voltage regulation characteristic as recorded in Figure 4-5 was obtained. The load current $I_\ell/2$ is equivalent to full load at unity power factor. The initial drop in load voltage due to inherent regulation is observed in the trace of $-\Delta E_\ell/2$. Close study shows that when load is applied the frequency of ringing is lower than when load is removed and the first overshoot is of lesser amplitude.

The alternator shaft speed $S\theta_G/100$ equivalent to 209 rad/sec or 2000 rpm shows a decrease in speed when load is applied. Since this is a type zero regulator, the speed will not return to the initial or unloaded speed since some error must exist and is directly related to loop gain. The torque shows an increase when load is applied as recorded in T /50. Since the characteristics of the diesel engine are approximated for this simulation, the levels have not been calibrated precisely.

The selected loop gain produces a system response that falls just outside the allowable parameters. The natural frequency of the underdamped voltage wave measures to be 0.09 sec/cycle or 11.1 Hz. Since the system has a damping characteristic of close to 0.1 and it is desired to maintain approximately the same speed of response, a compensating network in the forward loop of the voltage regulator was added. This is in the form of a lead lag network with the lead term set for 3.35 Hz and the lag at 13.7 Hz thus producing positive phase shift in the range of 11 Hz. The schematic

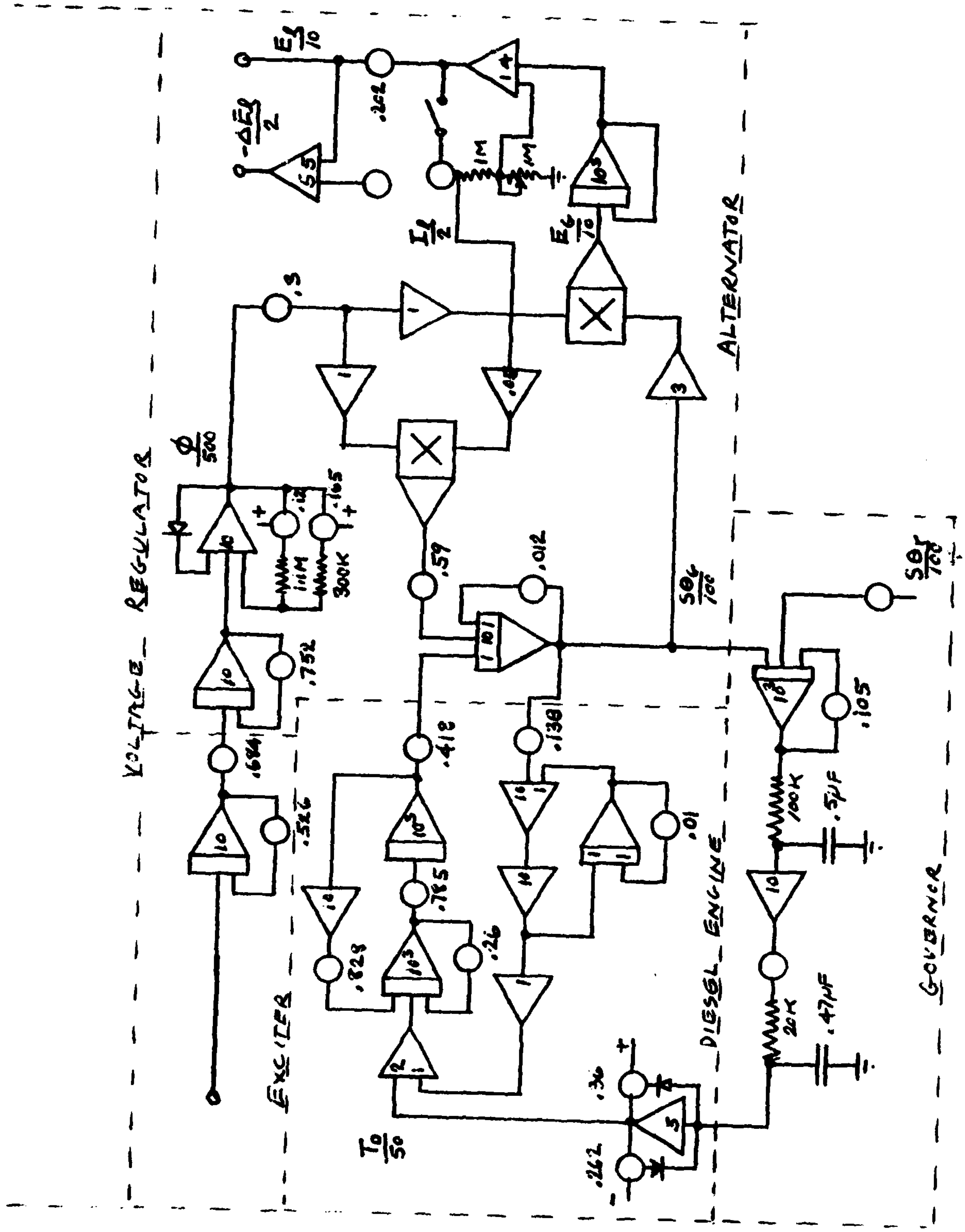


Figure 4-3. AC-APU Analog Computer Program

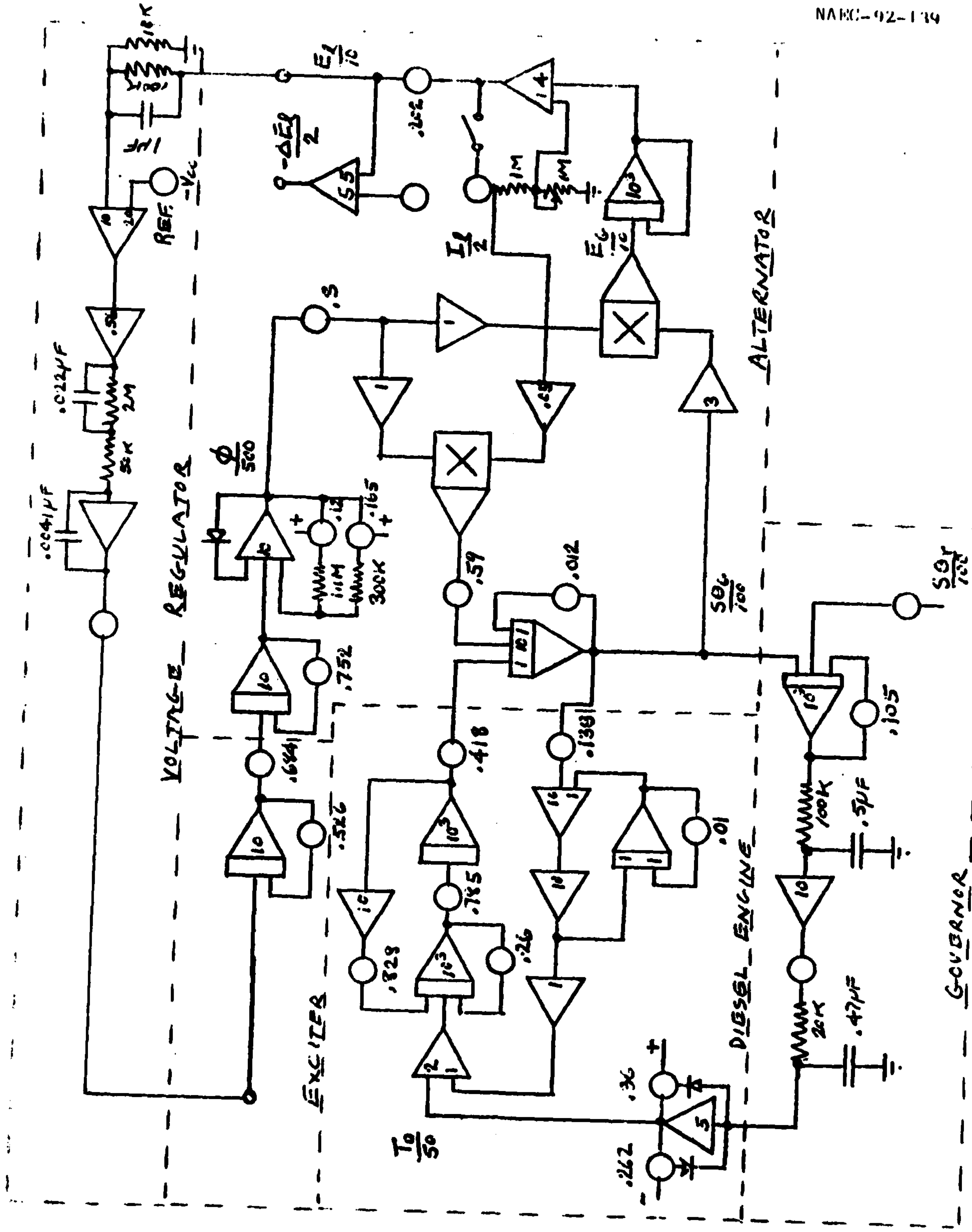


Figure 4-4. AC-APU Analog Computer Program

NO FORWARD LOOP COMPENSATION

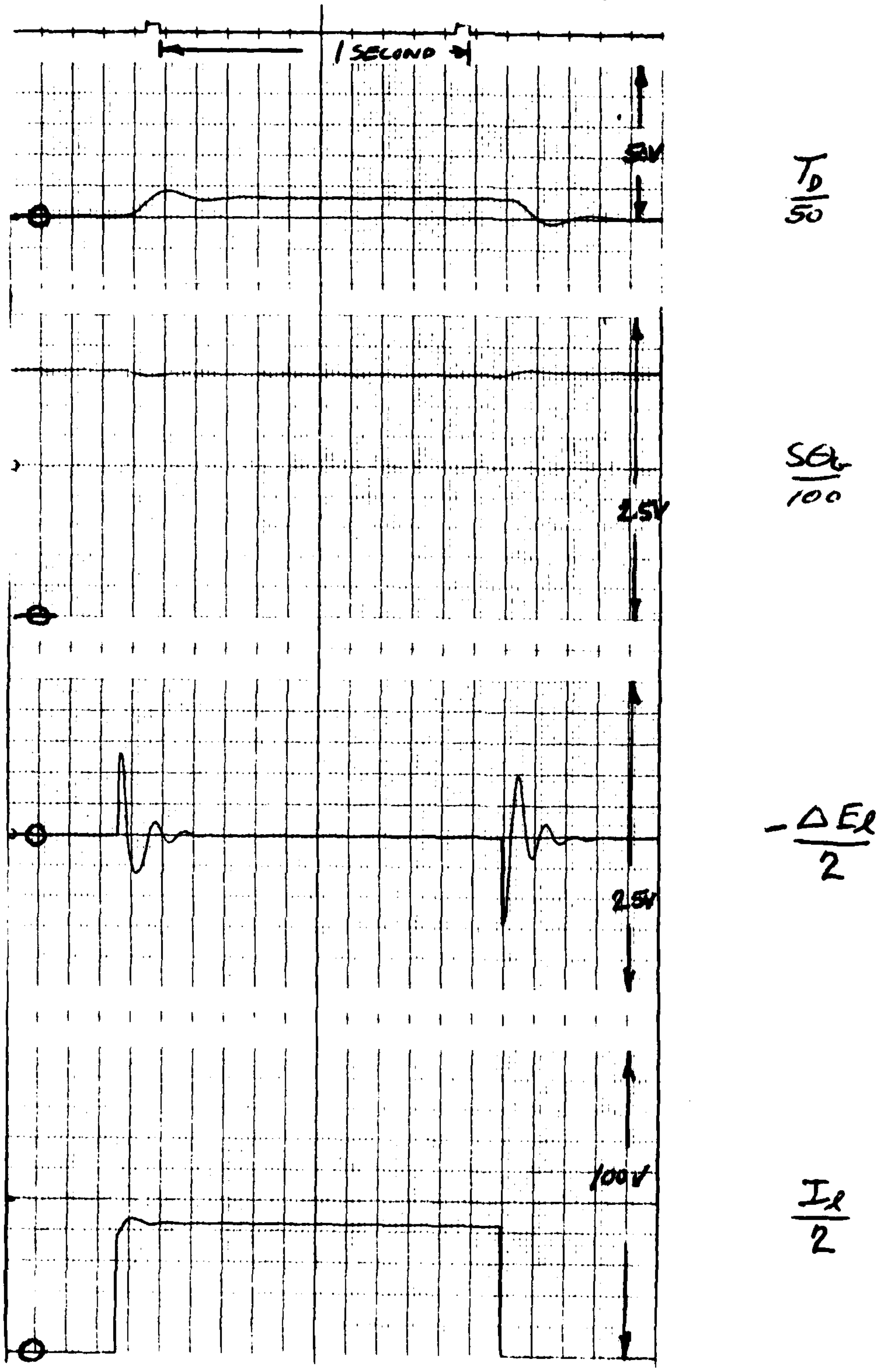


Figure 4-5. Alternator 10% Inherent Regulation

for this system is shown in Figure 4-6. The results of this compensation with adjustment of loop gain for optimum performance is shown in Figure 4-7. The system performance exhibits much greater damping and fits well within the allowable limits.

The same system characteristics as shown in Figures 4-4 and 4-6 have been used for the alternator with a 15% inherent regulation. Figure 4-8 is for the uncompensated system where the amplitude of regulation is much larger than that for the 10% design. Similar damping characteristics are observed. The compensation network does help in this design but would have to be modified to provide optimum performance. The compensated response is shown in Figure 4-9 and has identical compensation to that shown in Figure 4-6.

4.2.1 Compensation Selection

The linear analysis of the alternator and voltage regulator shown in Figure 4-4 has been calculated and plotted in Figure 4-10 with gain recorded as M_1 and phase shift as ϕ. In order to fit within the time profile of the transient response, the bandwidth of response must be in the order of 10 Hz or higher. This requires that the open loop gain of the system should be at least 57 db/S. Plotting the phase and gain characteristics of the open loop transfer on the Nichols chart shown in Figure 4-11, the characteristics of the closed loop response are obtained. This response is plotted in Figure 4-12 as closed loop nominal amplitude (M_1) versus frequency. The system has a definite characteristic of low damping as evidenced by the 4.5 db peak around 16 Hz. Since the phase shift shown in Figure 4-10 for ϕ_1 is nearly constant at 140° from 1 Hz to 10 Hz, this peak would be of the same amplitude for gains between 37 db/S and 57 db/S. The frequency of the peak would vary from 1.6 Hz to 16 Hz depending upon gain.

The approach used for compensation is to add positive phase shift to bring the phase angle back to 120 degrees or less at around 10 Hz. A compensation network with the lead and lag separated by a ratio of 4:1 will provide a maximum leading phase shift of 37 degrees when the lead is at a lower frequency than the lag. This characteristic has been included in Figure 4-10 as M_2 and ϕ_2 when incorporated with the alternator and voltage regulator characteristic of M_1. The phase and gain plotted on the Nichols chart of Figure 4-13 provides the open loop to closed loop response for the

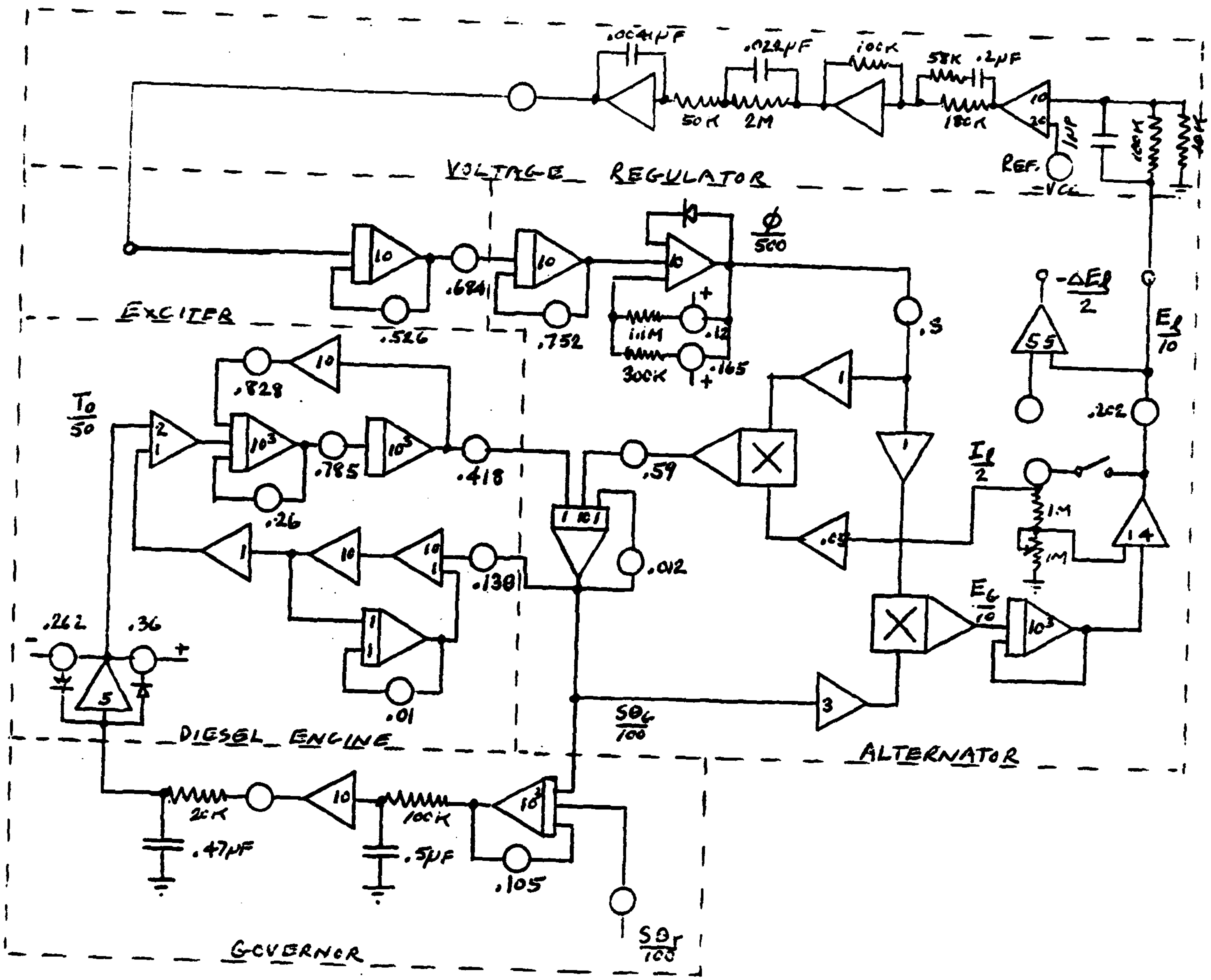


Figure 4-6. AC-APU Analog Computer Program

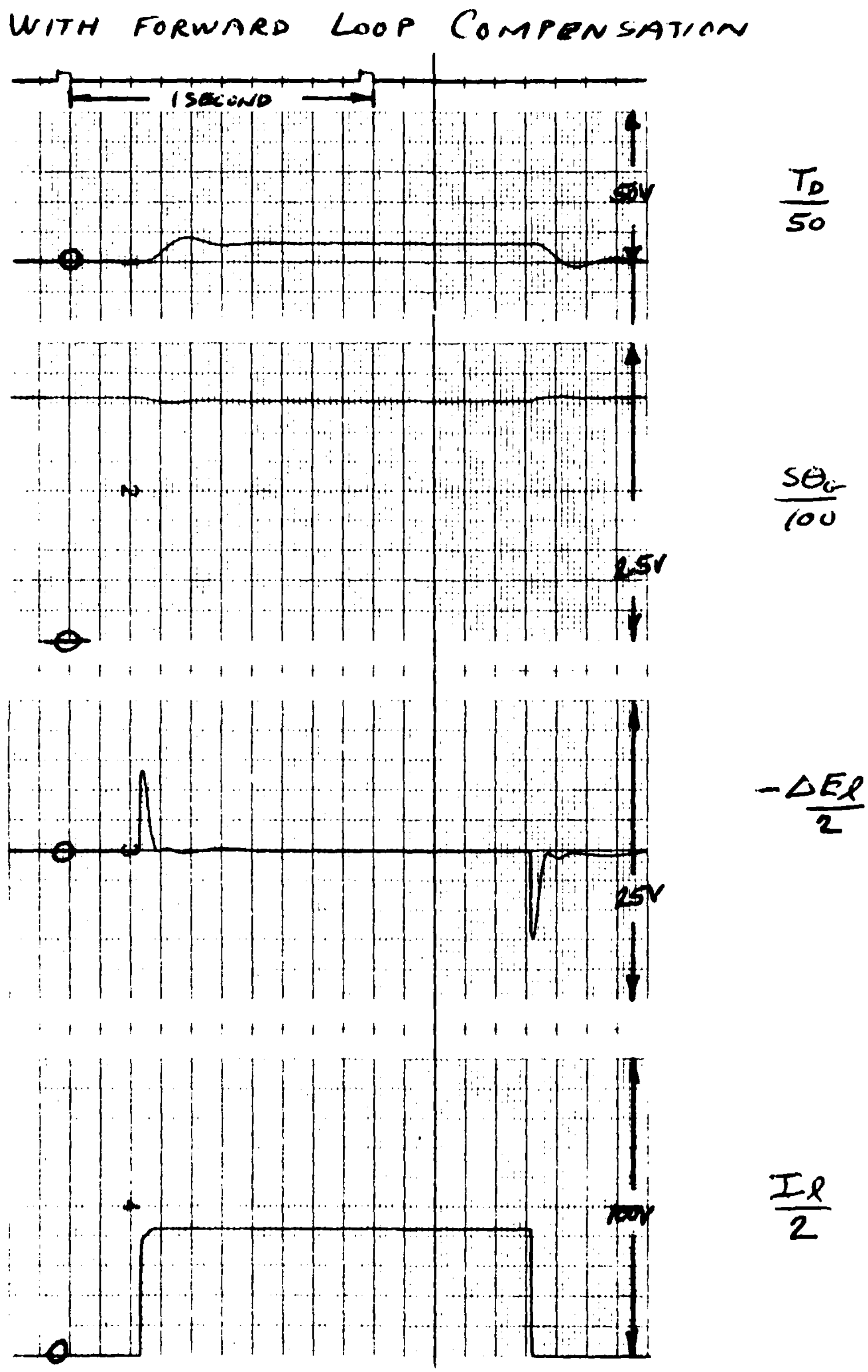


Figure 4-7. Alternator 10% Inherent Regulation

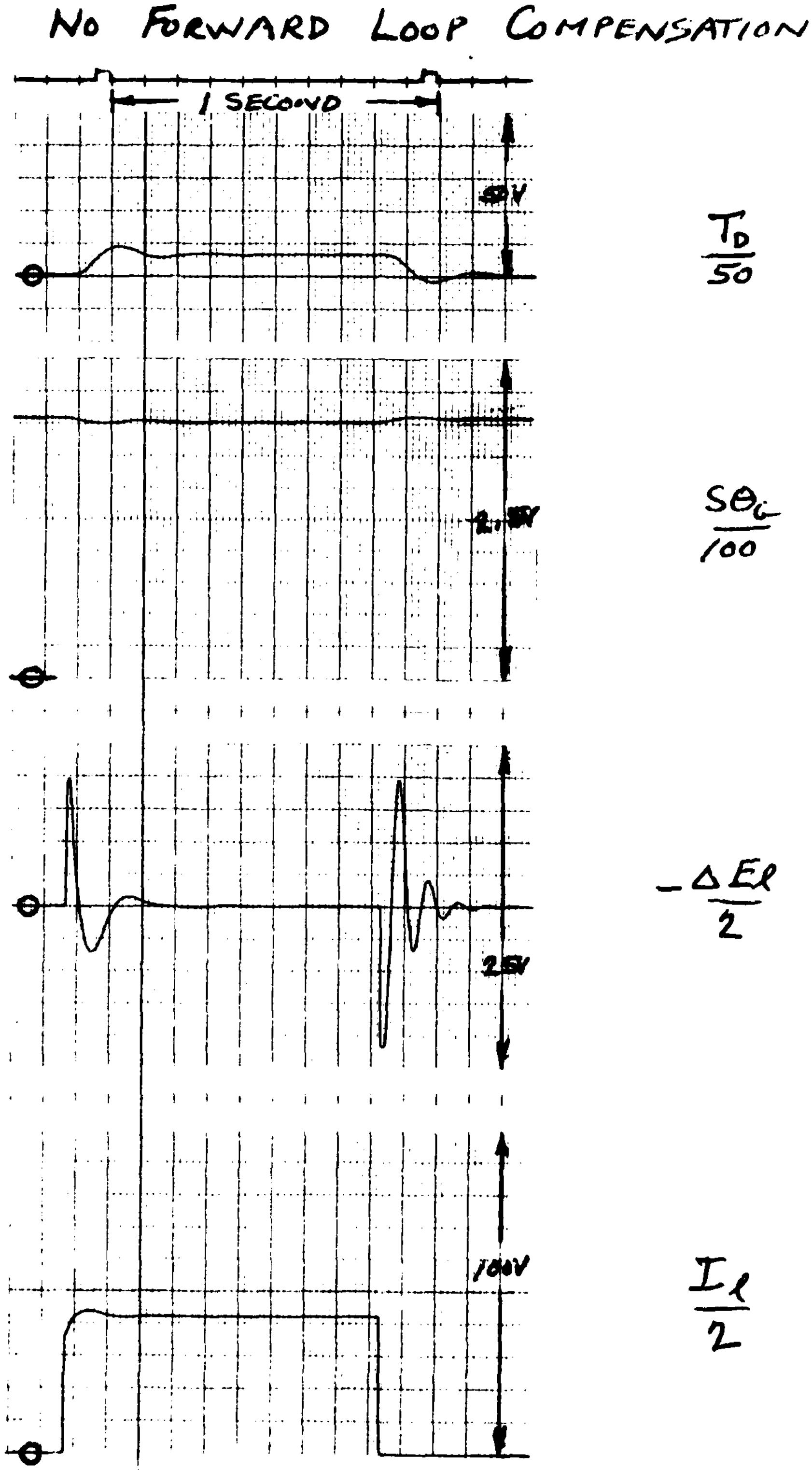


Figure 4-8. Alternator 15% Inherent Regulation

WITH FORWARD LOOP COMPENSATION

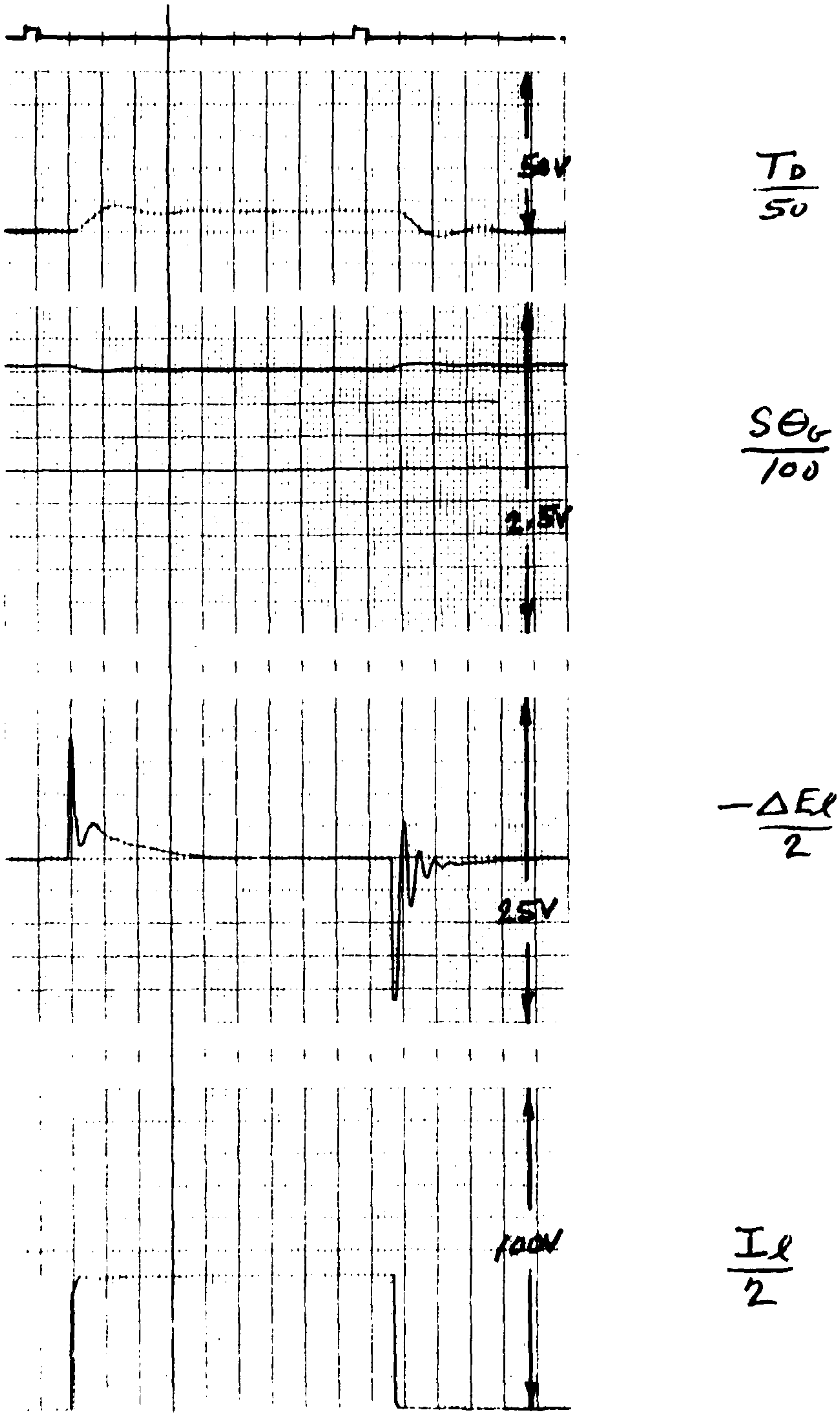


Figure 4-9. Alternator 15% Inherent Regulation

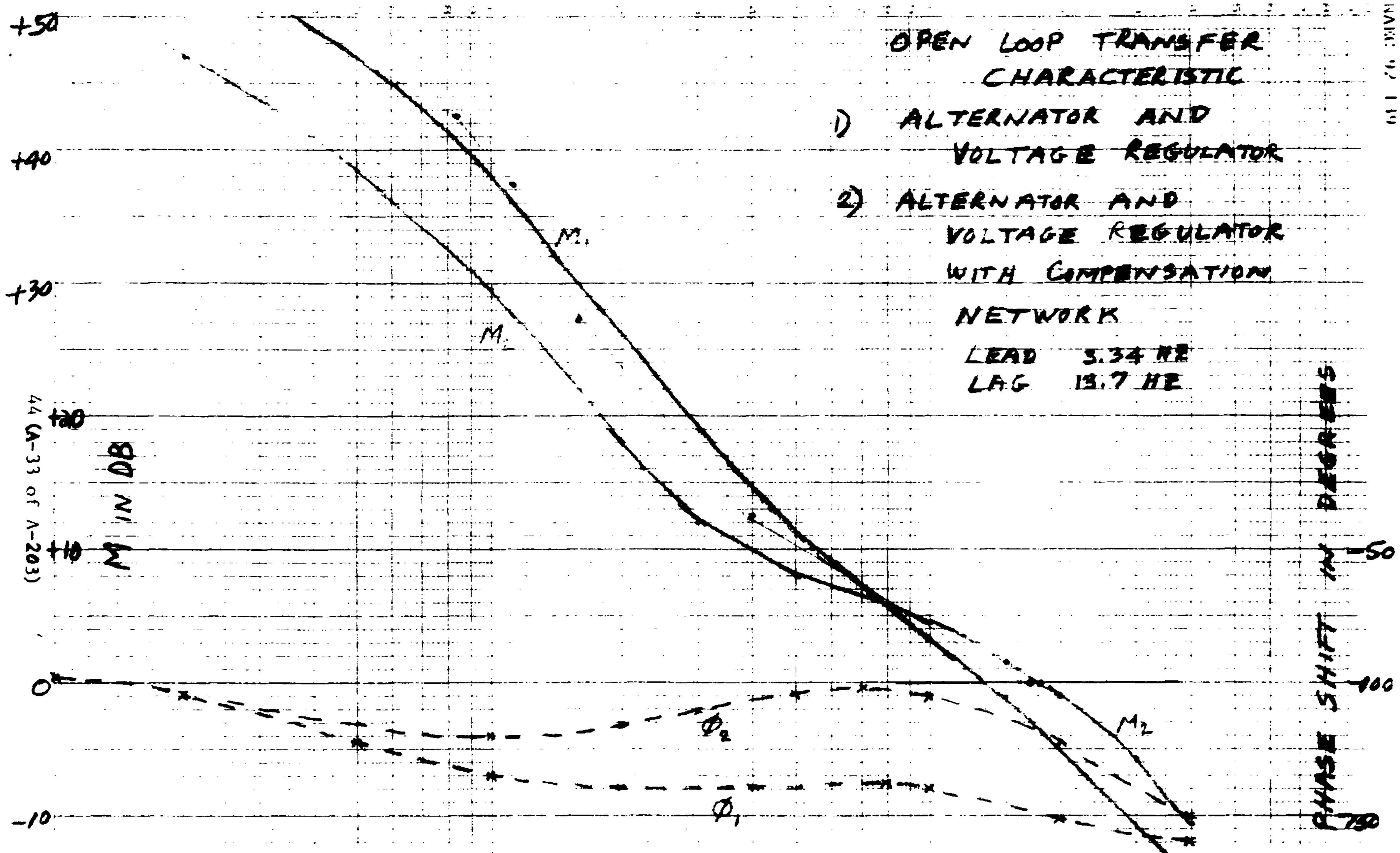


Figure 4-10. Open Loop Transfer Characteristic - With and Without Compensation

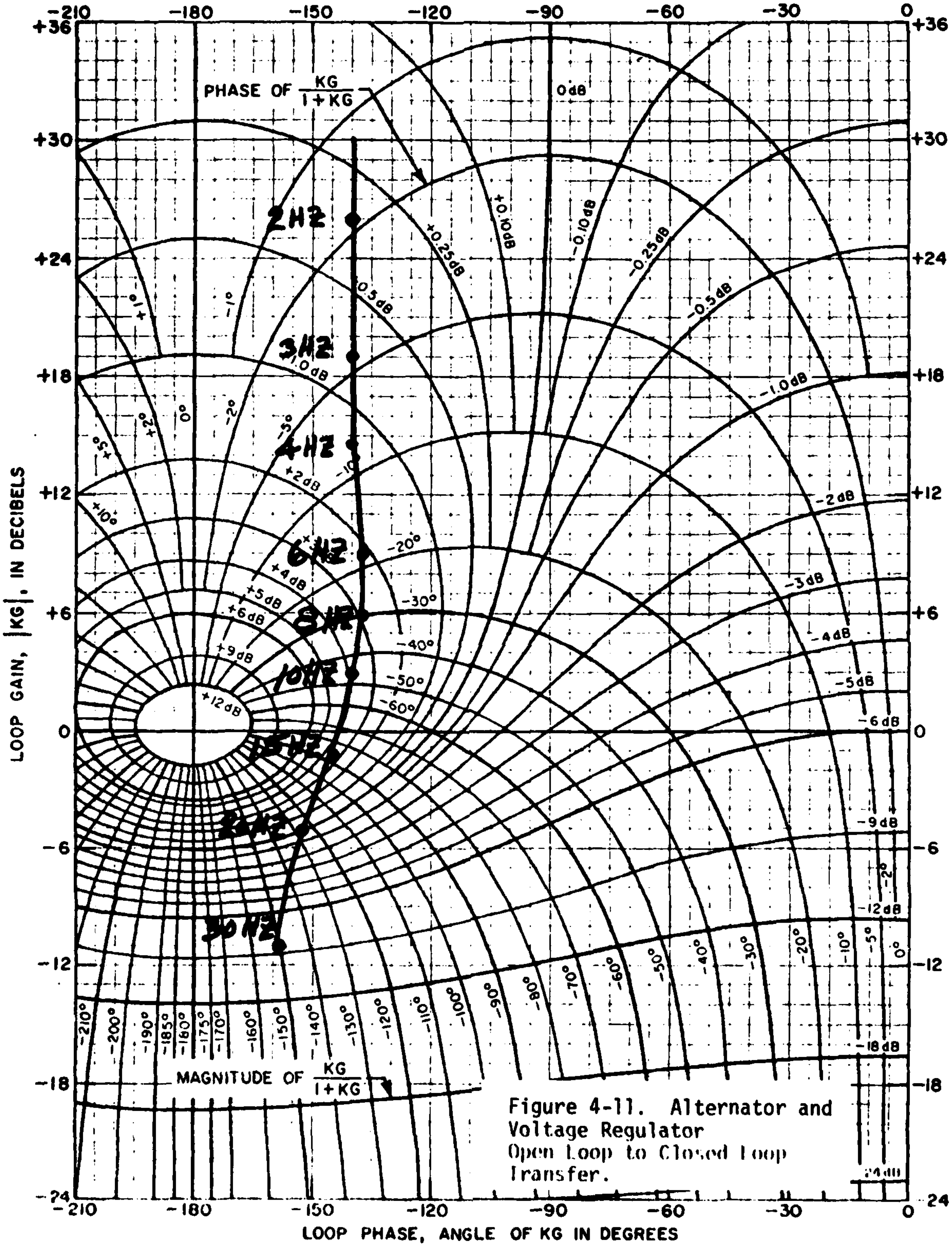


Figure 4-11. Alternator and Voltage Regulator Open Loop to Closed Loop Transfer.

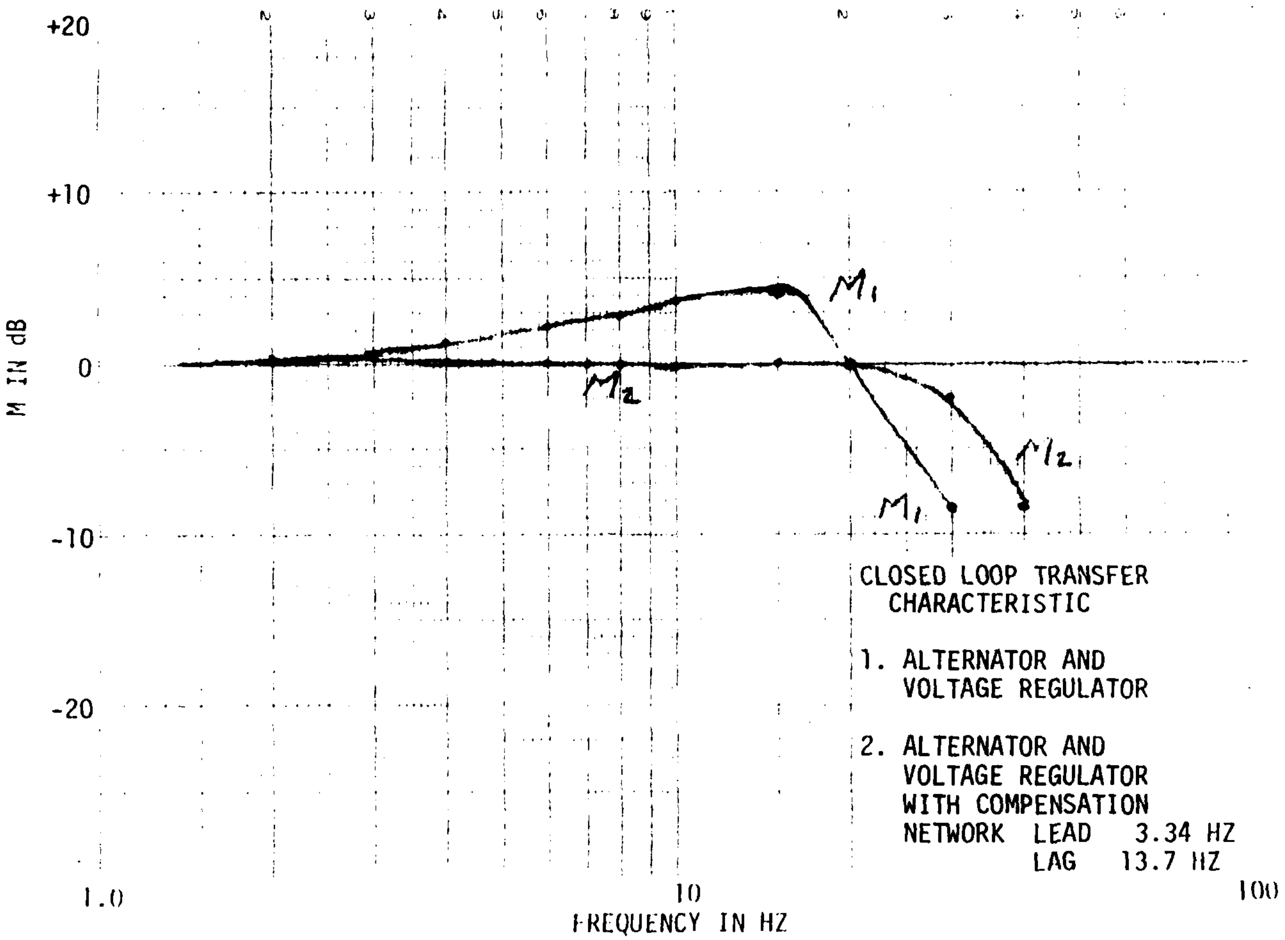


Figure 4-12. Closed Loop Transfer Characteristic, With and Without Compensation

compensated system. The closed loop response is plotted in Figure 4-12 recorded as M_2 for magnitude versus frequency. The system has a characteristic of critical damping and a bandwidth that is flat to 20 Hz.

The analog computer runs that include non-linearities are found in 4-5 to compare with M_1 and in 4-7 to compare to M_2.

During the course of the study an investigation was made to determine the effect of different generator field time constants. It was found that increasing the time constant by a factor of 3 had a minimal effect on system performance when compensation networks were used. Close to the same bandwidth could be achieved using linear system analysis. The characteristics of the open and closed loop frequency response for this system are shown in Appendix D.

4.2.2 Analysis of Speed Regulation System

Most diesel engine governors are of the type zero system as illustrated in each of the analog computer programs. The best system for maintaining frequency control is a type one system. This system has been simulated on the analog computer as shown in Figure 4-14. An integrator has been added to make the governor a type one system. Considerable compensation is necessary to stabilize the speed control loop. Performance of this circuit is shown in Figure 4-15. It will be noted that under full load conditions the speed returns to no load speed after the transient period. No attempt was made at this time to optimize the control characteristic of the governor system with the integrator in the loop.

Such a system is commercially available from the Woodward Governor Company and is described in their Bulletin 37013, PSG Governor. A picture of this type of governor is shown in Figure 4-16 where the electric drive motor is the integrator between error voltage and throttle position.

4.2.3. Analysis of Voltage Regulation System

The strictly analog system is theoretically the best system as far as bandwidth of response since there is continuous signal with which to operate. Linear analysis techniques and compensation networks are easily calculated and fabricated.

A disadvantage is encountered when large currents such as field or exciter currents are controlled by analog methods. In the specific case

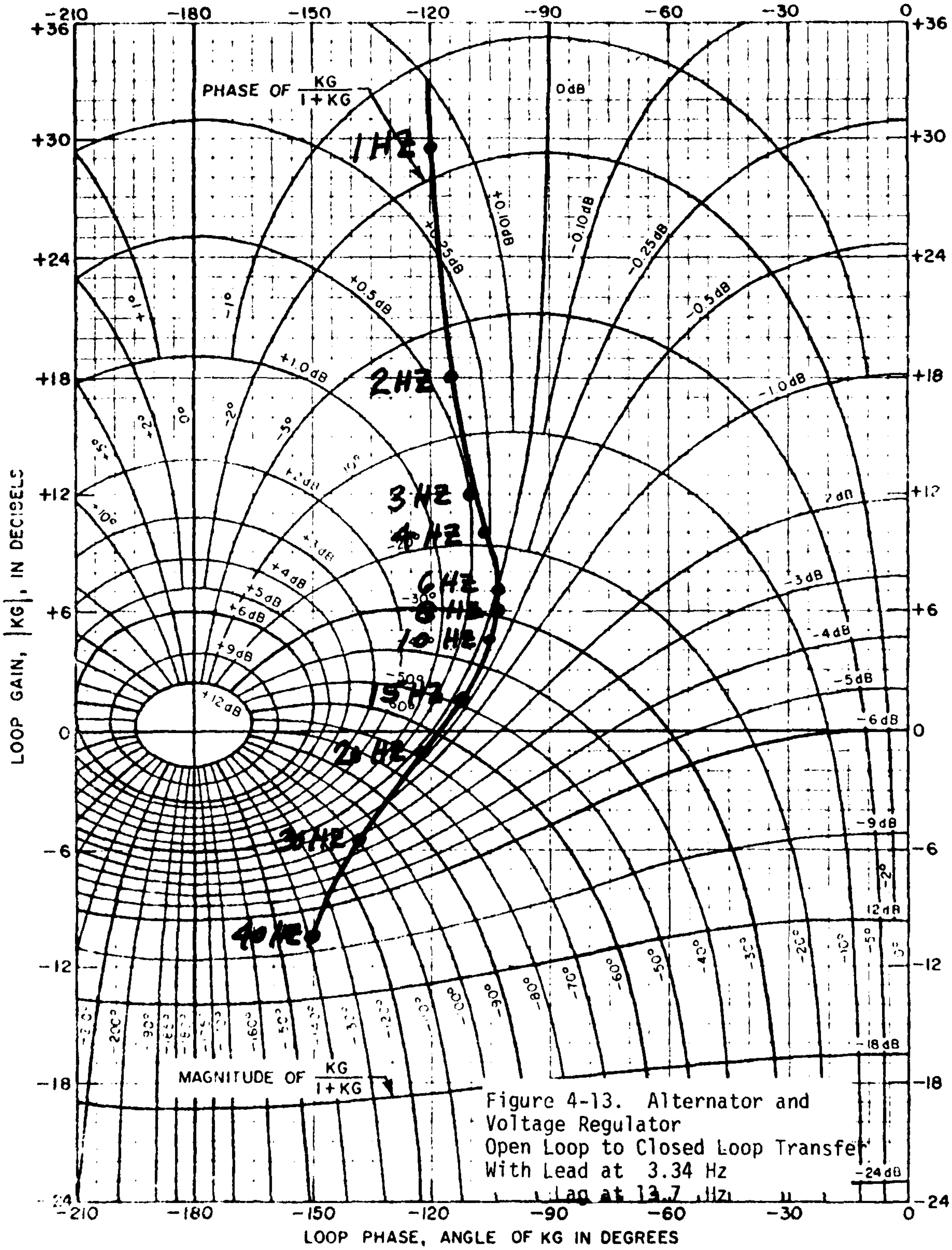


Figure 4-13. Alternator and Voltage Regulator Open Loop to Closed Loop Transfer With Lead at 3.34 Hz Lag at 13.7 Hz

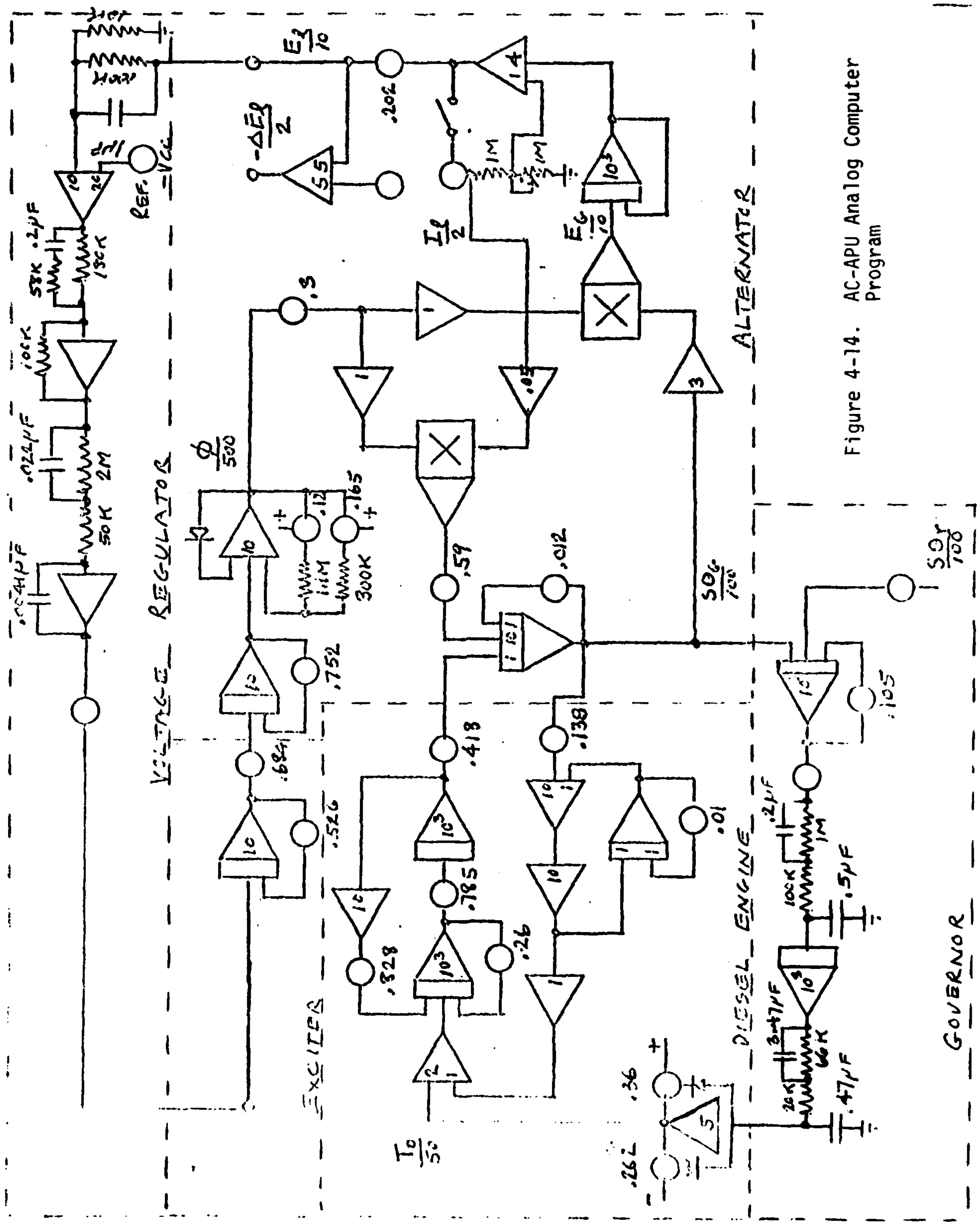


Figure 4-14. AC-APU Analog Computer Program

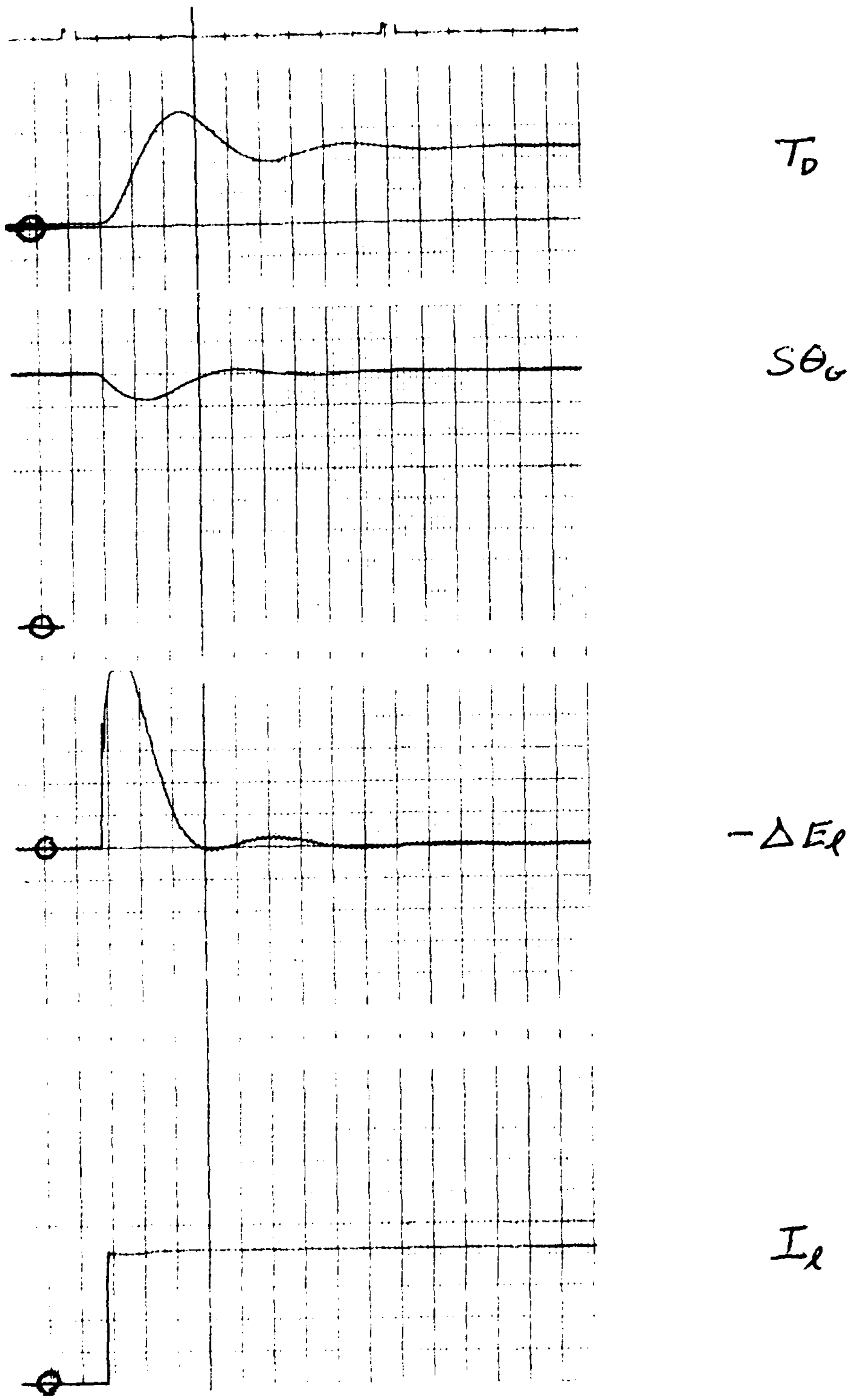
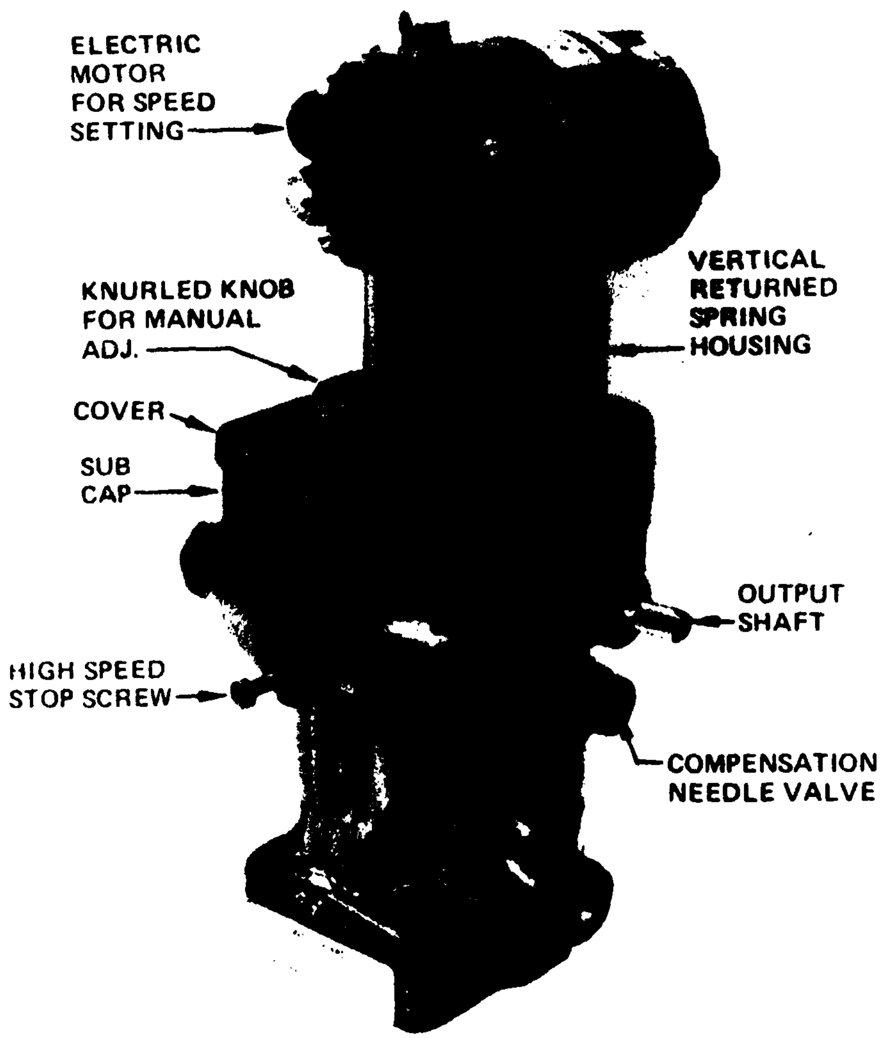


Figure 4-15. Speed Regulator with Integrator



[illegible] with Vertical Return Spring and Electric
[illegible]eed Setting Motor.

being studied, the exciter field is powered from a 28V DC source. Current must be regulated from zero to 3.3 amperes for an output voltage of 120V rms. The resistance of the field is 2.35 ohms thus making a maximum current capability of 28/2.35 = 11.9 amperes. In Figure 4-17 we have plotted load current to the exciter versus power dissipated in the series element. At the no load operating point, the power to be dissipated in heat is equal to:

$$P_D = [28 - I_{ex}(2.35)]\ I_{ex}$$

$$P_D = (28 - 7.755)\ 3.3$$

$$P_D = 66.8 \text{ watts}$$

4.3 DIGITAL METHODS

The basic regulation methods selected for study were the NAVAIR Design, bang-bang, multi-level bang-bang, direction sensitive multi-level bang-bang and the digital simulation of analog designs. The actual implementation of many of the digital techniques provided great insights into the problems and advantages of the various techniques. However, none of the methods were developed to an optimal state.

4.3.1 Test Bed for Digital and Hybrid Techniques

The digital and hybrid regulation techniques were tested in real time through the use of the combination of the digital and hybrid computers. The bang-bang techniques were programmed into a PACER 100 digital computer via analog to digital (A/D) and digital to analog (D/A) converters. The PACER was used as a regulator for the analog computer motor generator simulation. A block diagram of the system is presented as Figure 4-18.

The PACER provides a conservative comparison to existing microcomputer systems in that:

A. Its cycle time (1 μs) is fairly typical of microcomputer systems, and is, in fact, slower than many current microcomputer systems. For example, the XECON SMC360 has a typical instruction cycle time of 120 nonoseconds.

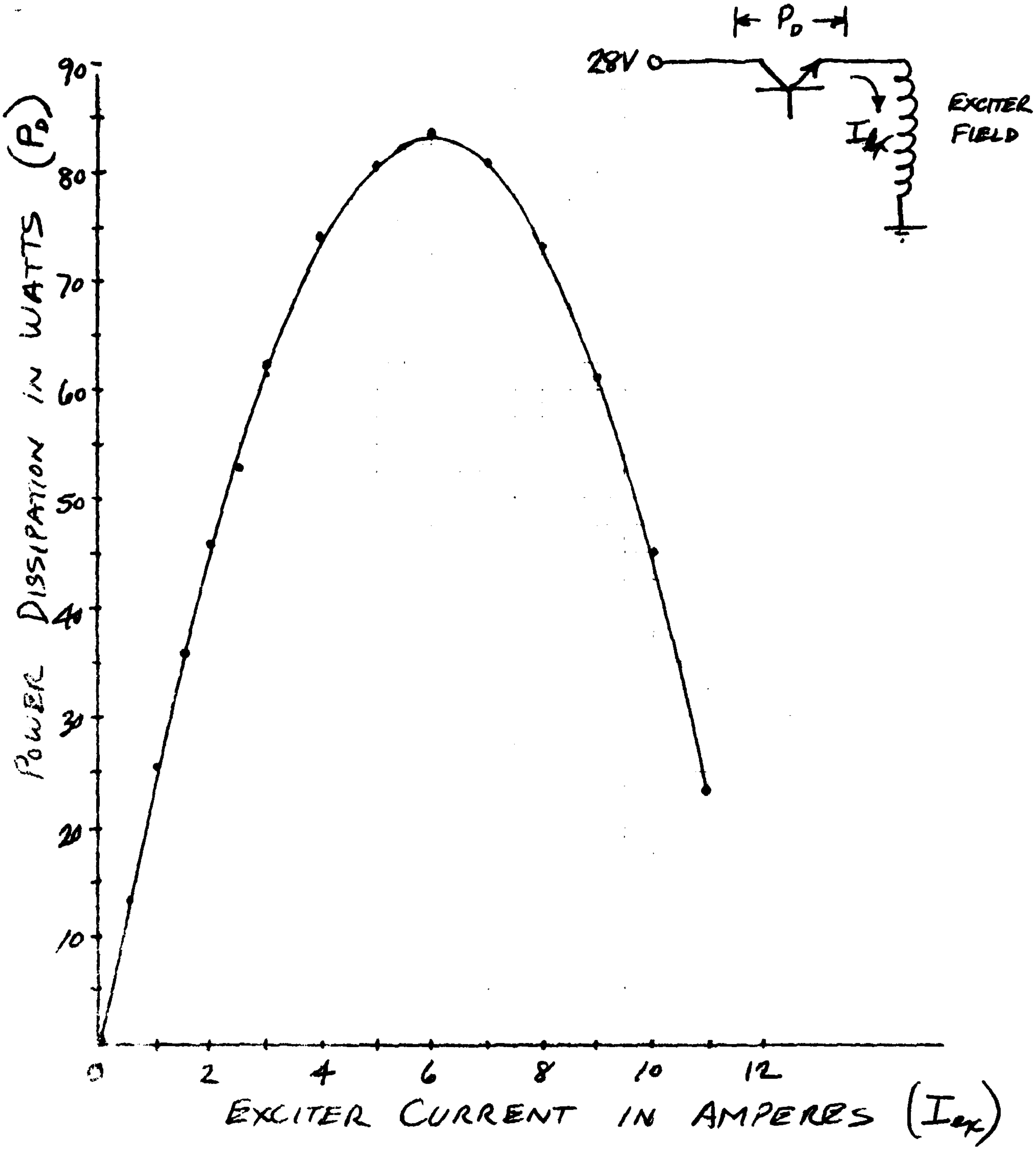


Figure 4-17. Power Dissipation in Exciter Field Control

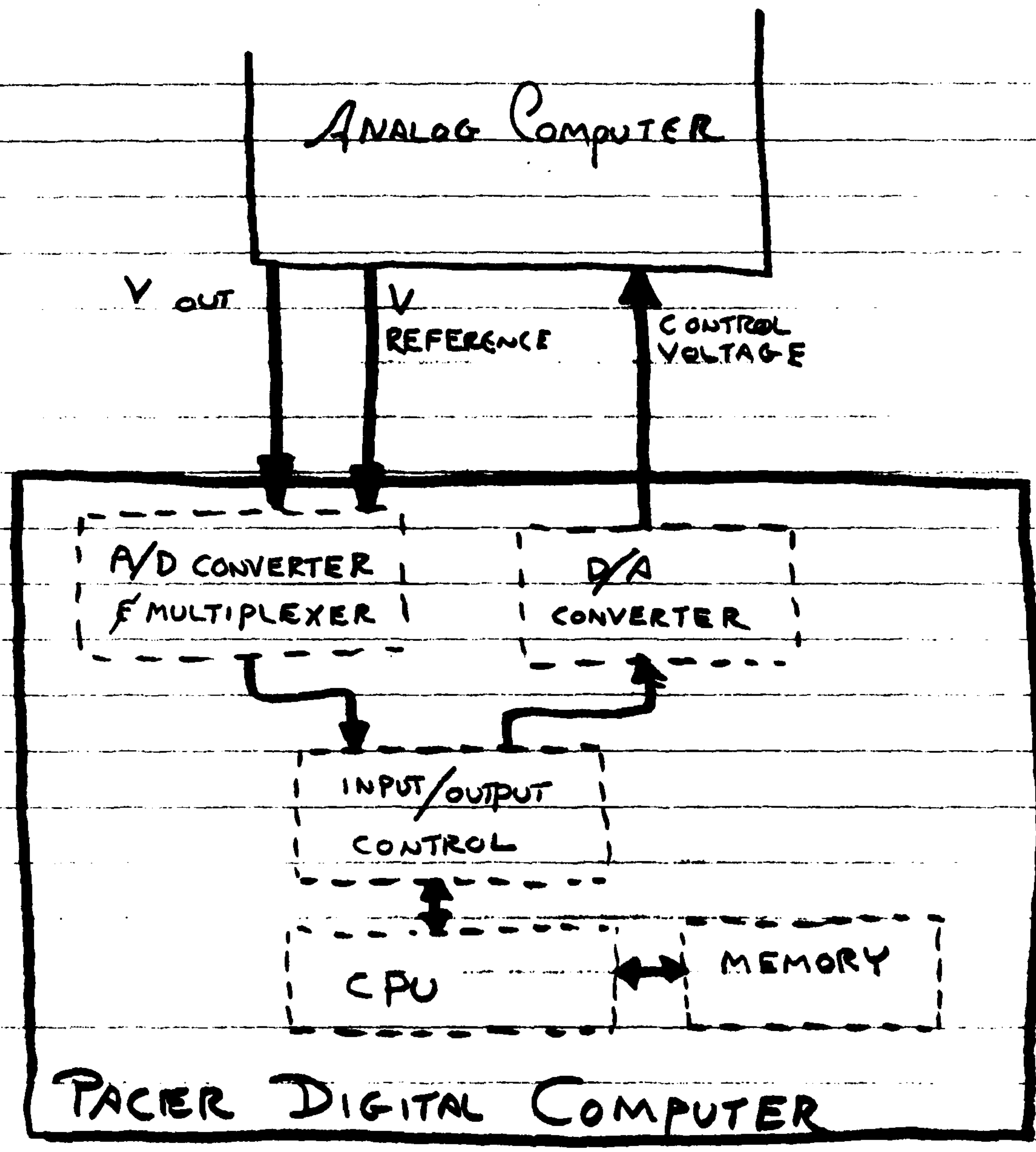


Figure 4-18. Block Diagram of Digital Computer Controller

B. While the PACER is basically a 16-bit machine, its A/D and D/A are 8-bit devices. Thus, all data manipulation is handled in bytes of 8 bits--the same as most microcomputers.

C. The PACER instruction set contains 84 basic instructions, fewer than most microprocessors. For example, the Digital Equipment Corporation's KD11F microprocessor uses 400 basic instructions.

The PACER assembly language program for the general bang-bang techniques is presented as Appendix C. A basic flow chart of the program is presented as Figure 4-19a. This flow chart represents the multi-level bang-bang (to be described in Section 4.3.4) with provisions for switching in a parallel regulator when the output voltage is within programmed limits. Variations of this basic flow chart and of the program are used to perform the different bang-bang techniques.

4.3.2 NAVAIR TECHNIQUE

The first digital method to be considered is that of a comparator operating on the integrated error output of the voltage regulator system. This is similar to the system described in the NAVAIR report 19-45-19, Figure 1-13, AC Voltage Regulator, Schematic Diagram. In this system the voltage sensed is 3-phase half wave rectified. A lead network in the voltage feedback to the summing junction provides the ripple frequency to turn the comparator on and off. Since the analog computer simulation is a D.C. equivalent of the A.C. voltage, the ripple frequency will not be present and the on-off cycle is, therefore, dependent upon the control loop time constant. This is verified in the several runs made for this system on the analog computer with various compensating networks.

The first digital control technique is shown in Figure 4-20. The driving pulses are from full positive to full negative thus forcing the exciter input in either direction. This is somewhat similar to using a diode around the exciter field to force the field to collapse at a high rate. The performance of this system is shown in Figure 4-21 where the adjustable gain has been set to provide optimum results. The response does have a switching rate of about 28 Hz with a peak to peak amplitude of 2.5V. This is within the allowable voltage band for transient operations.

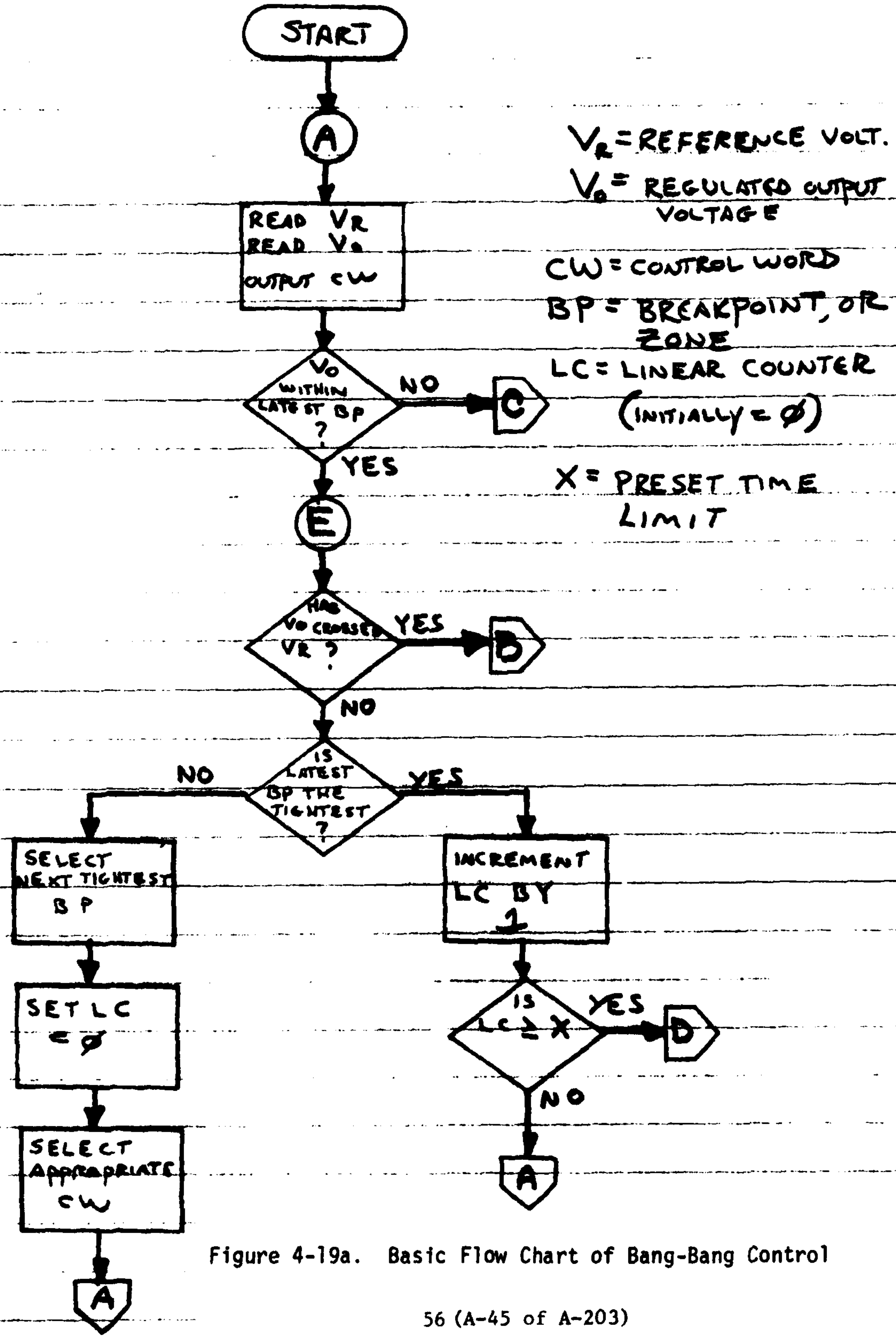


Figure 4-19a. Basic Flow Chart of Bang-Bang Control

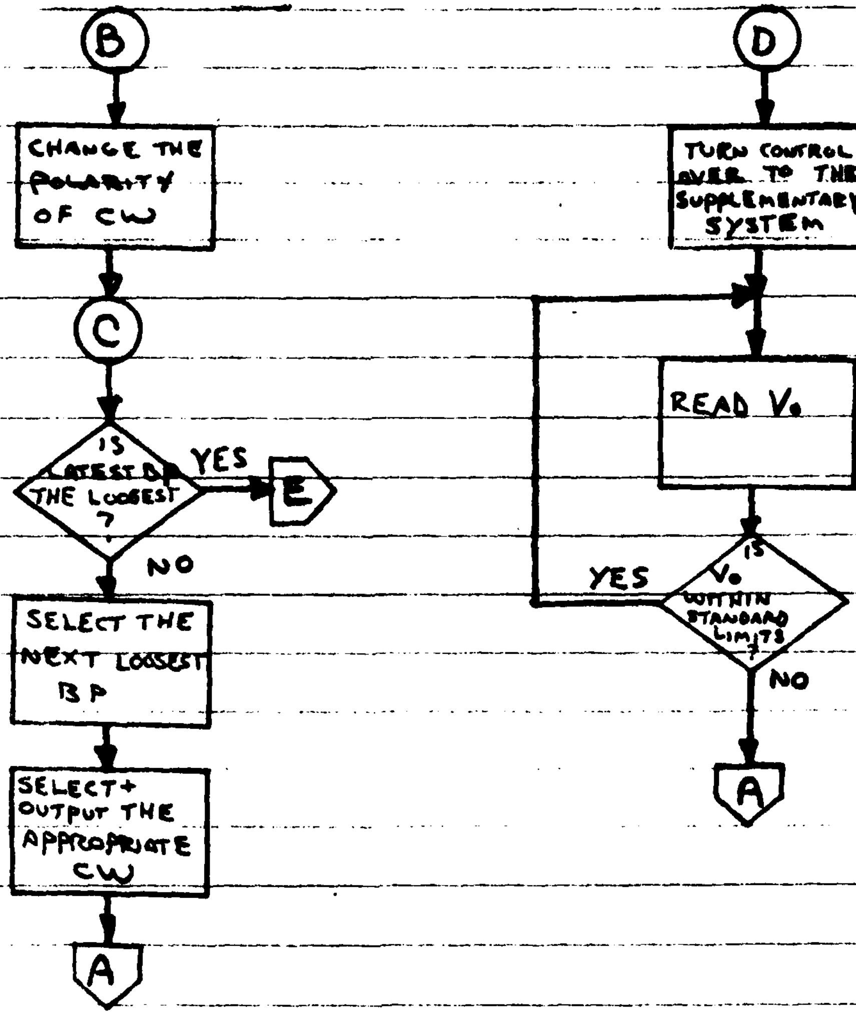


Figure 4-19b. Basic Flow Chart of Bang-Bang Control (Continued)

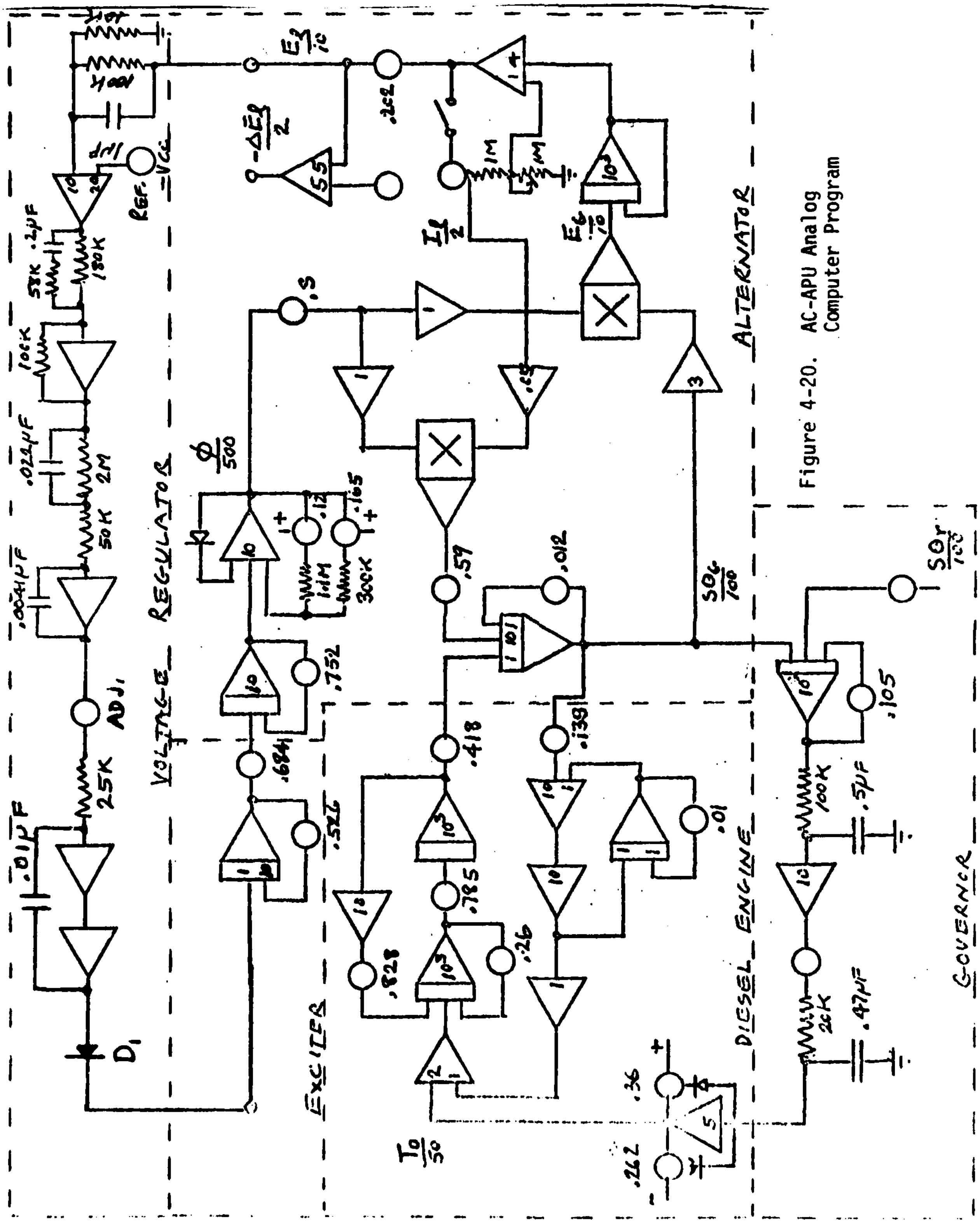


Figure 4-20. AC-APU Analog Computer Program

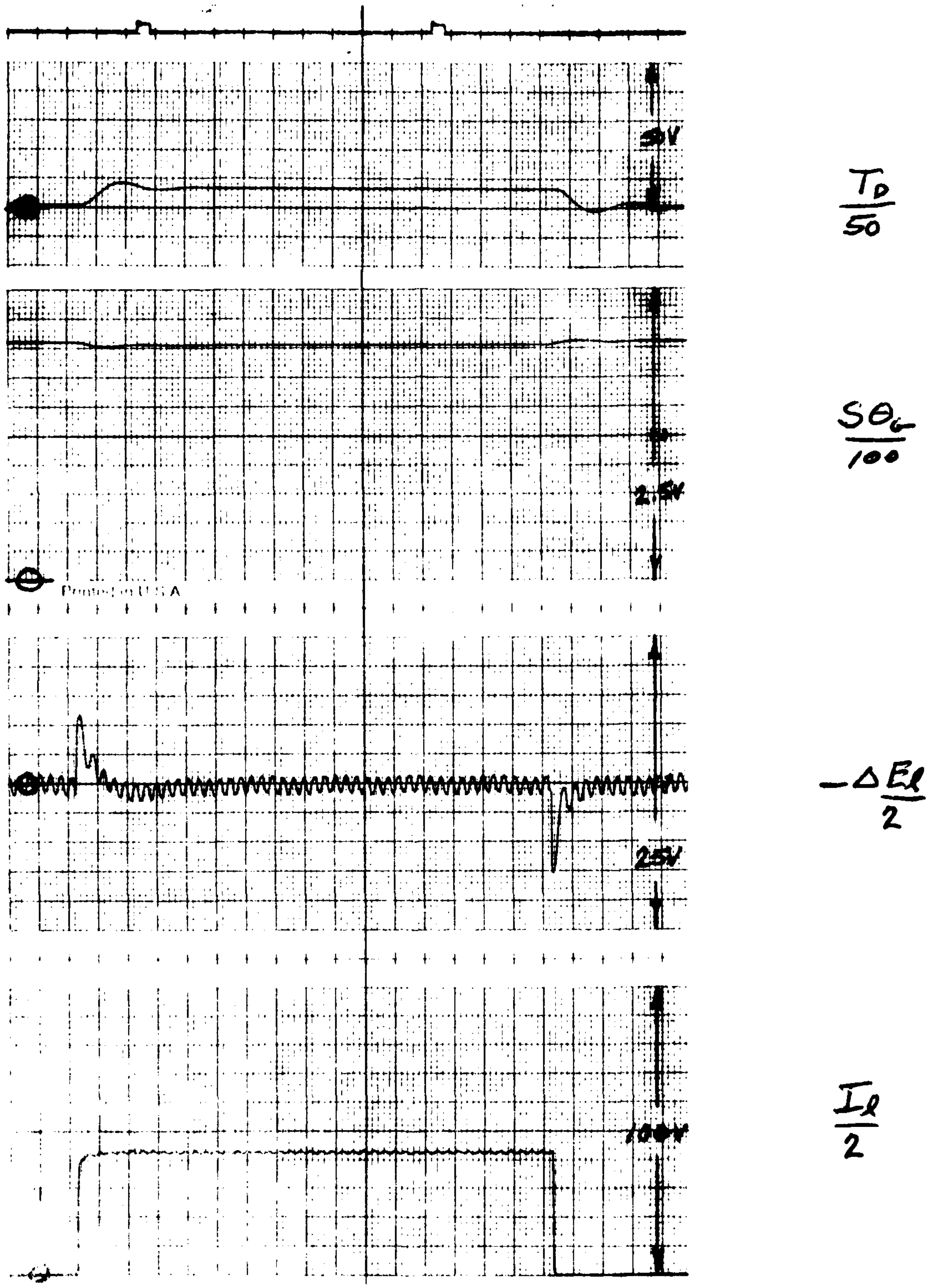


Figure 4-21. B1 Directional Comparator Control

The same system was simulated with the exception that a single direction of driving current pulse was permitted in the exciter field. This circuit is shown in Figure 4-22 where the diode D_1 has been added. The performance characteristic is shown in Figure 4-23 where it is evident that the voltage regulation is outside the allowable range during transient but just fits within the range during constant load. The switching rate is about 14 Hz which agrees with the anticipated response being twice the time period due to only unidirectional pulse modulation of the exciter current.

A higher loop gain would permit faster operation of the comparator circuit and decrease the load voltage excursion. The high frequency range of the system was increased by adding a lead compensation between the comparator and the exciter field input. In actual hardware this can be incorporated in the base of the transistor used to drive the field current. This circuit is shown in Figure 4-24. The performance of the circuit is shown for two values of capacitance C_1 with optimum gain settings. Figure 4-25 is the response when C_1 = .047 μF. Pulse modulation is evident in the recording of the exciter input voltage. The response is too slow and the transient falls outside the allowable limits. The constant load condition shows a clean and steady voltage level. A compromise is reached when C_1 = .01 μF and the gain adjusted for optimum performance as recorded in Figure 4-26. The switching rate is approximately 42.5 Hz and the response does fall within the constant load and transient envelope of performance requirement. The amplitude of load voltage ripple is approximately 1.2 volts peak to peak.

4.3.3 NAVAIR Design Analysis

In the NAVAIR system, a comparator is used to pulse width modulate the current delivered to the exciter field. This system has considerably lower losses since the series element is either fully saturated or completely cut off. The power dissipation is limited to the rise and fall time versus the repetition rate. As an approximation if the rise time is 10 microseconds and the repetion rate 1000 Hz, then the heat dissipation

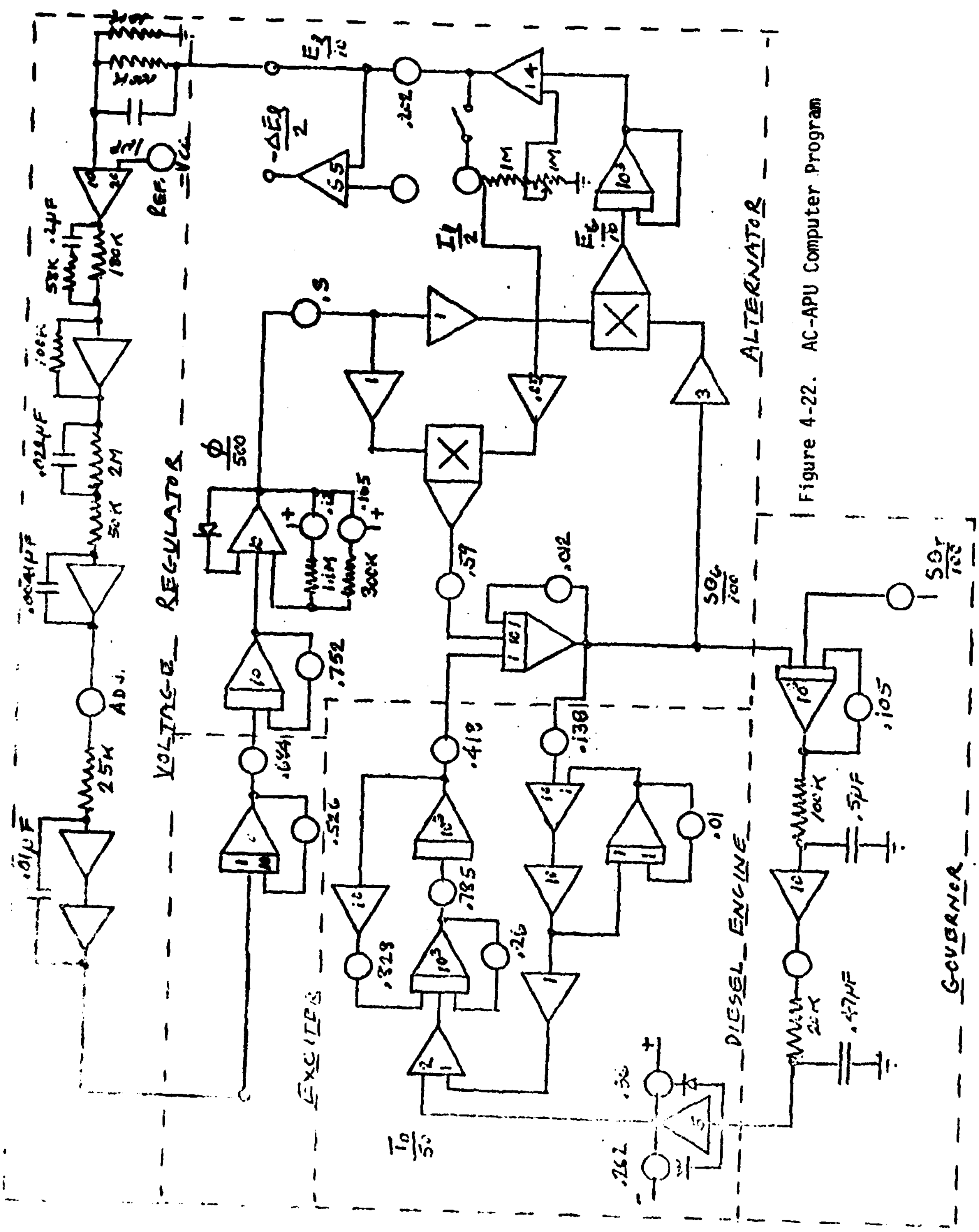


Figure 4-22. AC-APU Computer Program

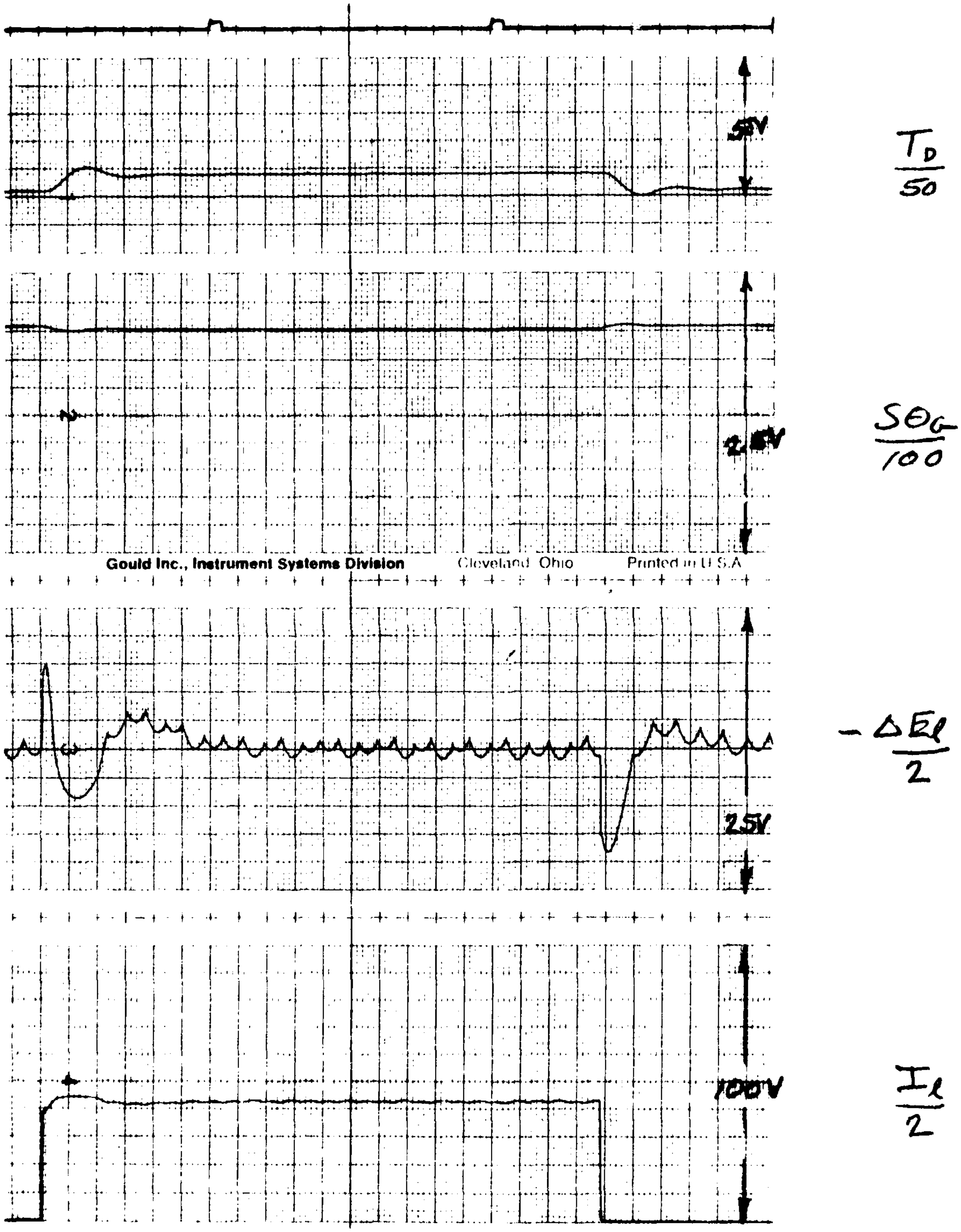


Figure 4-23. Uni-Directional Comparator Control

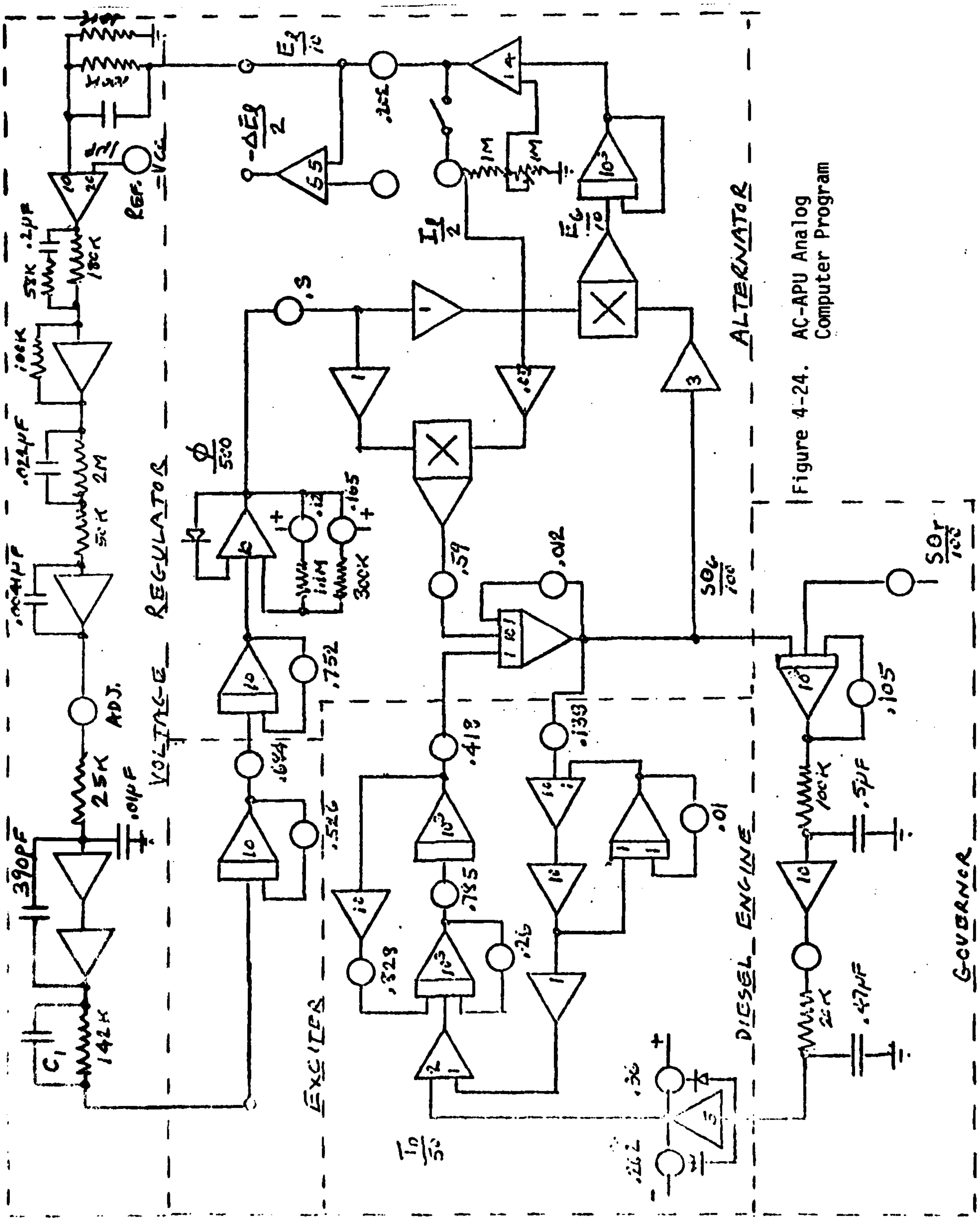


Figure 4-24. AC-APU Analog Computer Program

$C_1 = .047 \mu F$

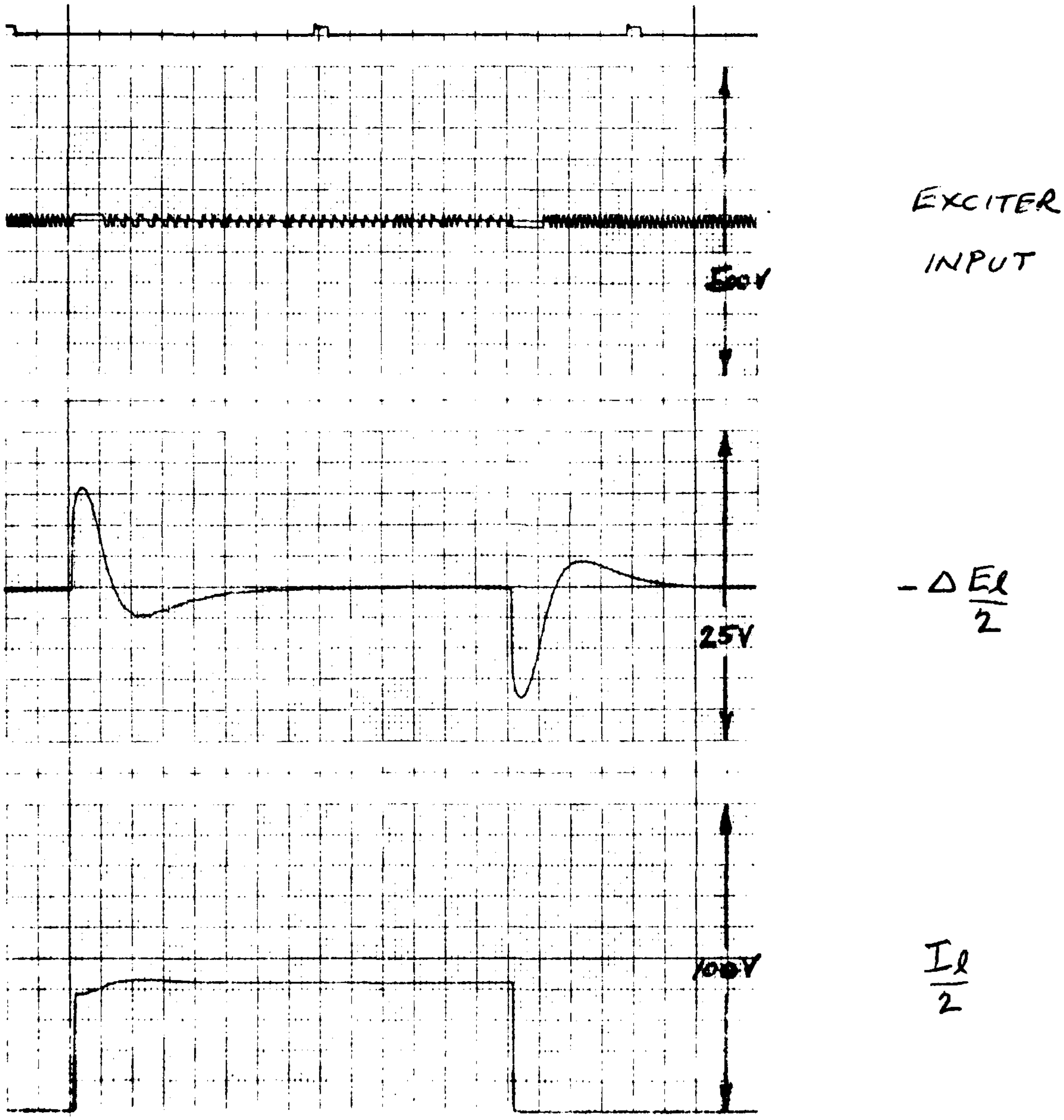
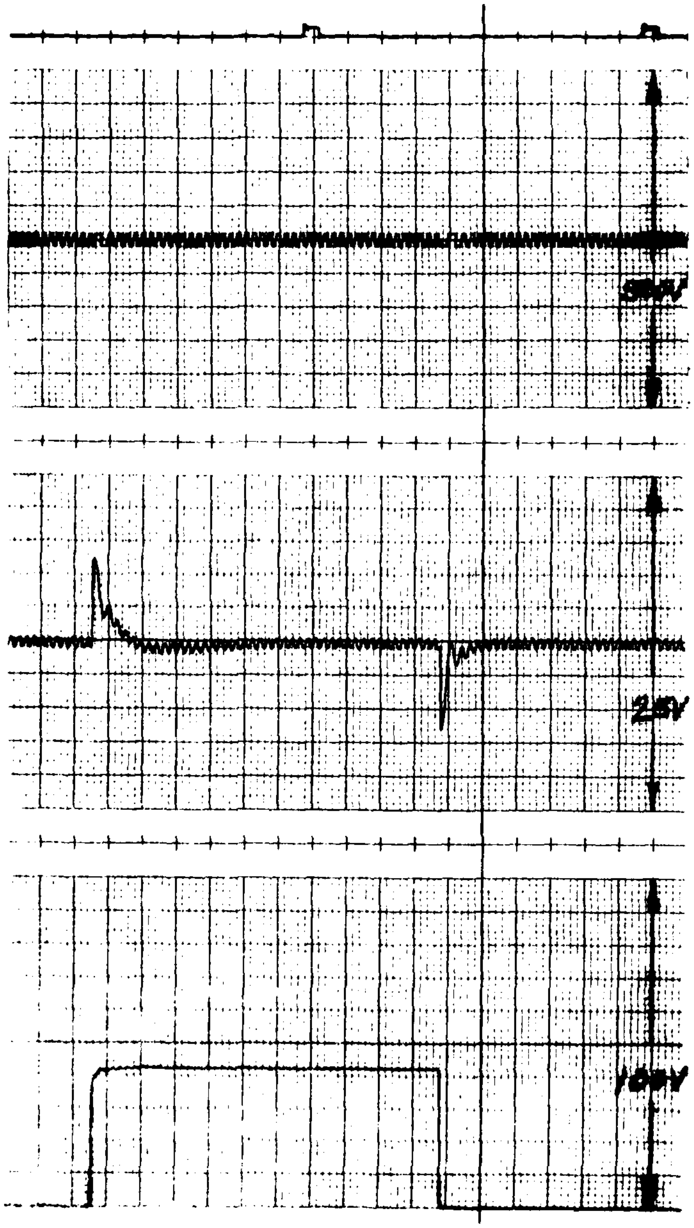


Figure 4-25. Bi-Directional Comparator with Compensation #1.

$C_1 = .01 \mu F$



EXCITER INPUT

$-\frac{\Delta E_\ell}{2}$

$\frac{I_\ell}{2}$

Figure 4-26. B1 Directional Comparator with Compensation #2

would be in the range of:

$$P_D' = \left(\frac{2 \times 10 \times 10^{-6}}{10^{-3}}\right) 80 \times .636 = 1.018 \text{ watts}$$

This is a considerable reduction in the heat dissipation problem.

The switching rate of the comparator is dependent upon either ripple frequency of the load voltage or the system time constants. For the AC application the ripple can be obtained from the rectified load voltage as in the design shown in the NAVAIR report 19-45-19, Figure 1-13.

4.3.4 Bang-Bang

A bang-bang controller operates by monitoring the output voltage of the motor generator set and depending on the value of the voltage calls for either maximum or minimum field current. This is similar to the NAVAIR design. For example, if the output voltage should be equal to 10 volts but is actually equal to a value above 10 volts, the controller will reduce the voltage by setting the field current to the minimum. If the output falls below 10 volts, the controller responds by setting the field current to the maximum level. In this way the controller switches on or off in an attempt to maintain a constant output voltage level.

The rate of this on-off switching is a function of current demands and the switching level of the controller. If for example, a sudden current demand is placed on the motor generator, the voltage will tend to fall, and the controller will respond by holding the field current at maximum until the voltage recovers. The chief advantage is that, in the optimum design, the recovery time is minimized because the field current is maximized.

The switching level of the controller is the level at which the controller recognizes that the voltage is too high or too low. Normally, the off level is V + h and the on level if V - h, where V is the desired output and h is a small preset voltage level. This is also known as hysteresis. The smaller the h, the faster the controller will respond to variations in V by switching the field current.

In the computer program the bang-bang system was implemented by using one break point (output voltage was either above or below the reference) and two control words (the field current was switched between full on and full off). The program was also modified so that the parallel regulator was never switched in; thus, the pure bang-bang effect was obtained.

4.3.5 Analysis of Bang-Bang Technique

The major problem with the pure bang-bang system as implemented was oscillation of the regulator's output voltage. The bang-bang decision (to switch from high field current to low field current) was based on the relationship of the output voltage to the reference voltage. When the output voltage was greater than the reference voltage, the field current control was set to the low value; when output was less than the reference, the field current control was set to the higher value. However, the momentum of the output voltage is such that about .05 seconds, after the bang-bang level has been applied, is required to reverse direction. Figure 4-27 presents an example of the oscillation. This effect may be eliminated or minimized by a number of methods. One such method is to optimize the gain of the control signal to the field current. This would reduce the time to reverse the momentum of the voltage and thus reduce the amplitude of the oscillation.

The bang-bang scheme could be performed by a microcomputer in a time sharing mode with the display and diagnostic routines. It is estimated (based on the PACER) that a computer could perform the diagnostic and display routines and still make bang-bang decisions at speeds in excess of 1 KHz.

The hardware required, in addition to that already assumed for display and diagnostics, would be as little as the dedication of one digital output line for the control signal, dedication of one A/D multiplexer channel for reading to regulator output voltage, use of approximately 100 words of memory, and the addition of a field current driver circuit. In actual hardware dollars this would be about $100.

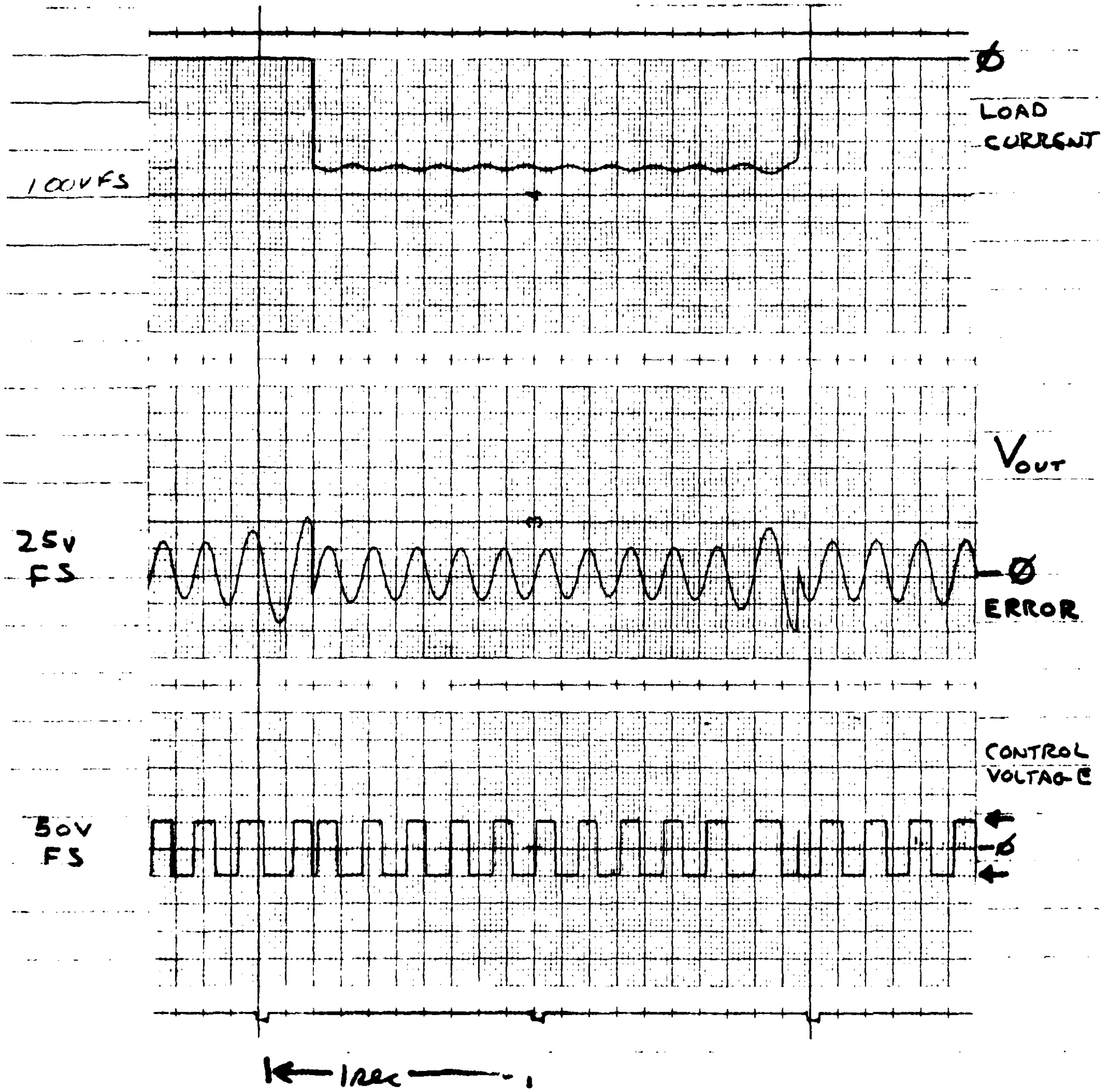


Figure 4-27. An Example of V_{out} Oscillations Occurring with Bang-Bang Control.

4.3.6 Multi-Level Bang-Bang

Multi-level bang-bang (MLBB) operates in a manner similar to pure bang-bang except the controller does not simply turn the field current on or off. The controller sets the field current to a level dependent on the difference between the actual output voltage and the desired output voltage. The chief advantage of this method is that, optimally, it combines the fast recovery of bang-bang with the smooth operation of a linear circuit.

The control can be described as a look-up table. Given the output voltage, the table indicates the field current setting for best regulation. An example of a look up table is presented as Figure 4-28. Referring to the figure, if the desired output voltage was 10 and the actual voltage was 18 volts, the field current would be turned off; if the output voltage was 1, the field current would be turned completely on. The operation as described so far is identical to pure bang-bang. However, if the output voltage were 7.5, the field current would be set to 60% of full scale; a reading of 16V will result in a field current setting of 10% of full scale, etc. Since a digital computer is programmable, any voltage breakpoint and field current value could be assigned and modified without effecting the hardware. Ideally, the optimum values would be selected for the regulator.

In the computer program, the multilevel bang-bang system was implemented as described--through the use of a look-up list. The computer stored a list of breakpoints. These breakpoints represented zones above and below the reference voltage. Each breakpoint or zone had a corresponding control word. The control word represented the desired field current to be supplied when the output voltage was within the zone.

4.3.7 Analysis of Multi-level Bang-Bang Techniques

A reduction in the amplitude of the output voltage oscillation was achieved by switching from pure bang-bang control to the multilevel bang-bang (see Figure 4-29).

Most of the hardware required for MLBB is identical to that used in pure bang-bang, the major exception being the field current driver. In the

OUTPUT VOLTAGE RANGE*	FIELD CURRENT % OF FULL ON
20 TO 17.0	0
16.9 TO 14.0	10
13.9 TO 12.0	40
11.9 TO 9.0	50
8.9 TO 7.0	60
6.9 TO 4.0	90
3.9 TO 0.0	100

* IN THIS EXAMPLE, 10 VOLTS IS THE DESIRED OUTPUT VOLTAGE.

Figure 4-28. An Example of a Look-Up Table for Multi-Level Bang-Bang Control

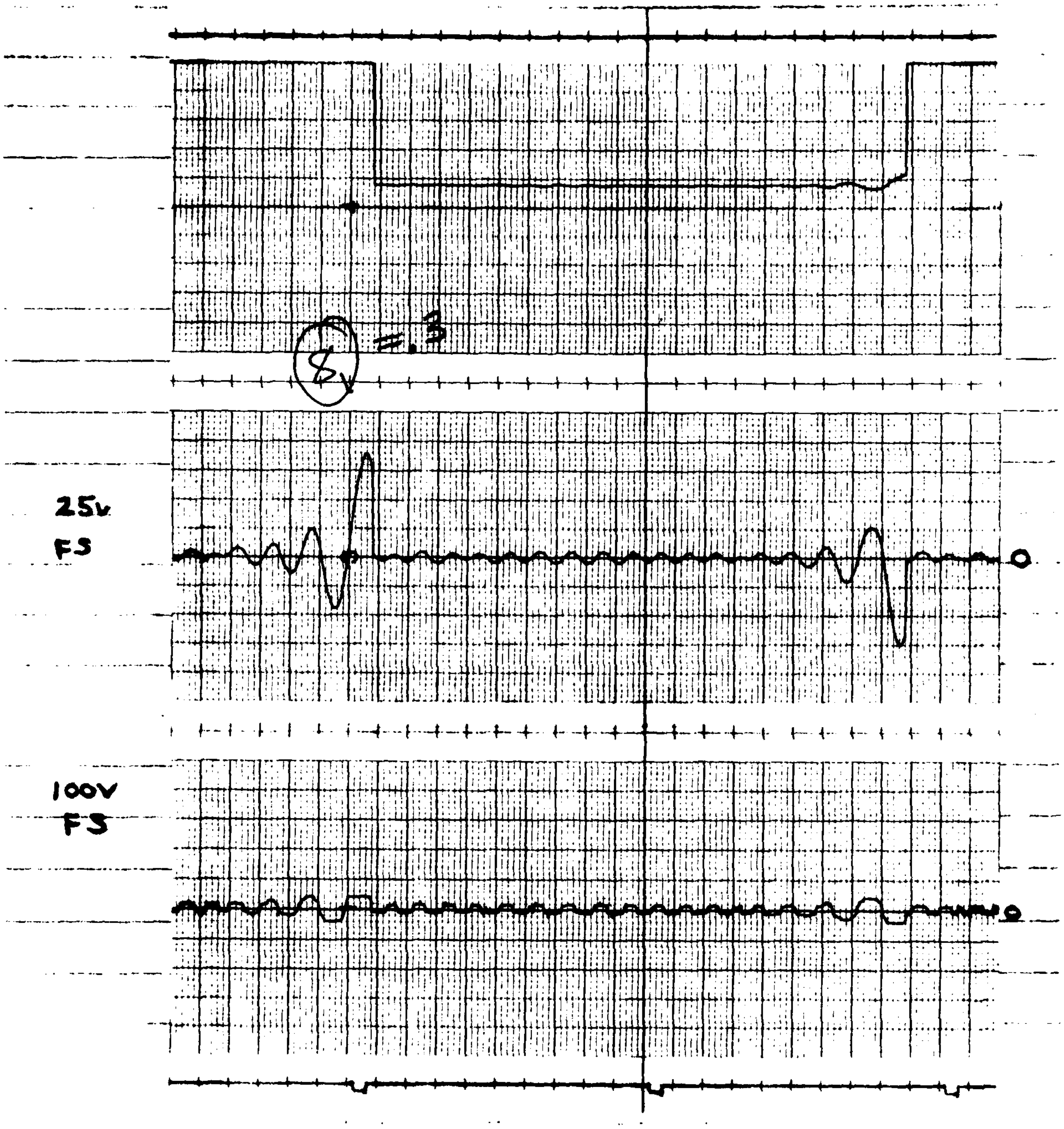


Figure 4-29. An Example of Multi-Level Bang-Bang Control

bang-bang case the driver can be a single saturating switch; however, in multiple bang-bang the driver can be either a non-saturating driver or an adjustable gain saturating driver. The non-saturating driver would be less complex but also less efficient (more heat) than the adjustable gain saturating driver.

The hardware cost of the saturating driver would be about $60 compared to about $30 for the non-saturating driver. The other hardware addition would be a requirement for about 200 more words of memory. The estimated hardware cost of adding the MLBB with a saturating field current driver is $150 (about $50 more than the bang-bang controller). MLBB would not demand significantly more computer time than bang-bang. Therefore, the controlling rate could still be in excess of 1 KHz.

4.3.8 Direction Sensitive Multi-Level Bang-Bang

Direction sensitive multi-level bang-bang (DSMLBB) is yet a further extension of the basic bang-bang scheme. DSMLBB is similar to MLBB in that the control is dependent on the difference between the desired and actual output voltage. However, DSMLBB takes past events into consideration by adding direction of the output voltage as a control parameter.

Continuing the example of a look up list, Figure 4-30 shows a list for DSMLBB. Notice that the selection of field current depends on the direction of the output voltage. For example, if the voltage were sitting at 10V when a load was placed on the line, the voltage would tend to drop or go down. If the voltage dropped to 5 volts, the controller would try to recover by calling for full field current (100%). If the voltage began to rise, to say 5.1 volts, the field current selection would be made from the "up" column and would be 90%. As the voltage further recovered (8 volts) the control would be selected from the charts "up" column.

Thus when the load is changed and the actual voltage is moving away from the desired voltage, the control reacts quickly and applies a decisive counter control; however, as the voltage begins to approach the desired value, the control is such as to allow the voltage to recover with minimum overshoot. Ideally, this system will rapidly control load transients with

OUTPUT VOLTAGE* ZONE	FIELD CURRENT % OF FULL ON — DIRECTION OF VOLTAGE	
	UP	DOWN
20 TO 17.0	0	0
16.9 TO 14.0	0	10
13.9 TO 12.0	10	40
11.9 TO 9.0	45	55
8.9 TO 7.0	60	90
6.9 TO 4.0	90	100
3.9 TO 0.0	100	100

* IN THIS EXAMPLE, 10 VOLTS IS THE DESIRED OUTPUT VOLTAGE.

Figure 4-30. An Example of a Look-Up Table for the Direction Sensitive Multi-Level Bang-Bang Control.

a minimum overshoot.

The computer program to implement the DSMLBB scheme was an extension to the MLBB program. A subroutine was added to determine, at each occurrence of reading the output voltage, if the output voltage had changed directions (output voltage derivative zero crossing). If the direction had not changed control word for the zone would be read as in the MLBB program. However, if the direction of the output voltage has changed, the control word would be selected from another list.

4.3.9 Analysis of Direction Sensitive Multi-Level Bang-Bang

The MLBB experiments showed (Figure 4-29) that the particular design required over 300 ms to regulate after application of 100% load. DSMLBB was implemented in an attempt to reduce the settling time. Figure 4-31 presents a DSMLBB run in which the settling time was reduced to below 200 ms.

The only hardware difference between MLBB and DSMLBB is the addition of about 100 words of memory in the latter case. This comes to a hardware cost difference of about $10. The computer time requirements remain essentially unchanged.

4.3.10 Digital Simulation of Analog Designs

The digital simulation of an analog design consists basically of solving a differential equation in real time. The equation can be written from an existing analog design. The chief advantage of this method is that the regulation scheme can be modified in software without changing any hardware. This advantage may aid in creating a controller with a single hardware design but with versatility to control various AC-APUs.

4.3.11 Digital Simulation of Analog Designs

Any analog regulator circuit that can be built can be simulated by the digital computer, by solving the circuit equations. The only real questions in the current case are: Can the computer solve the equation in real time and if yes, does the computer have enough time to perform the diagnostic

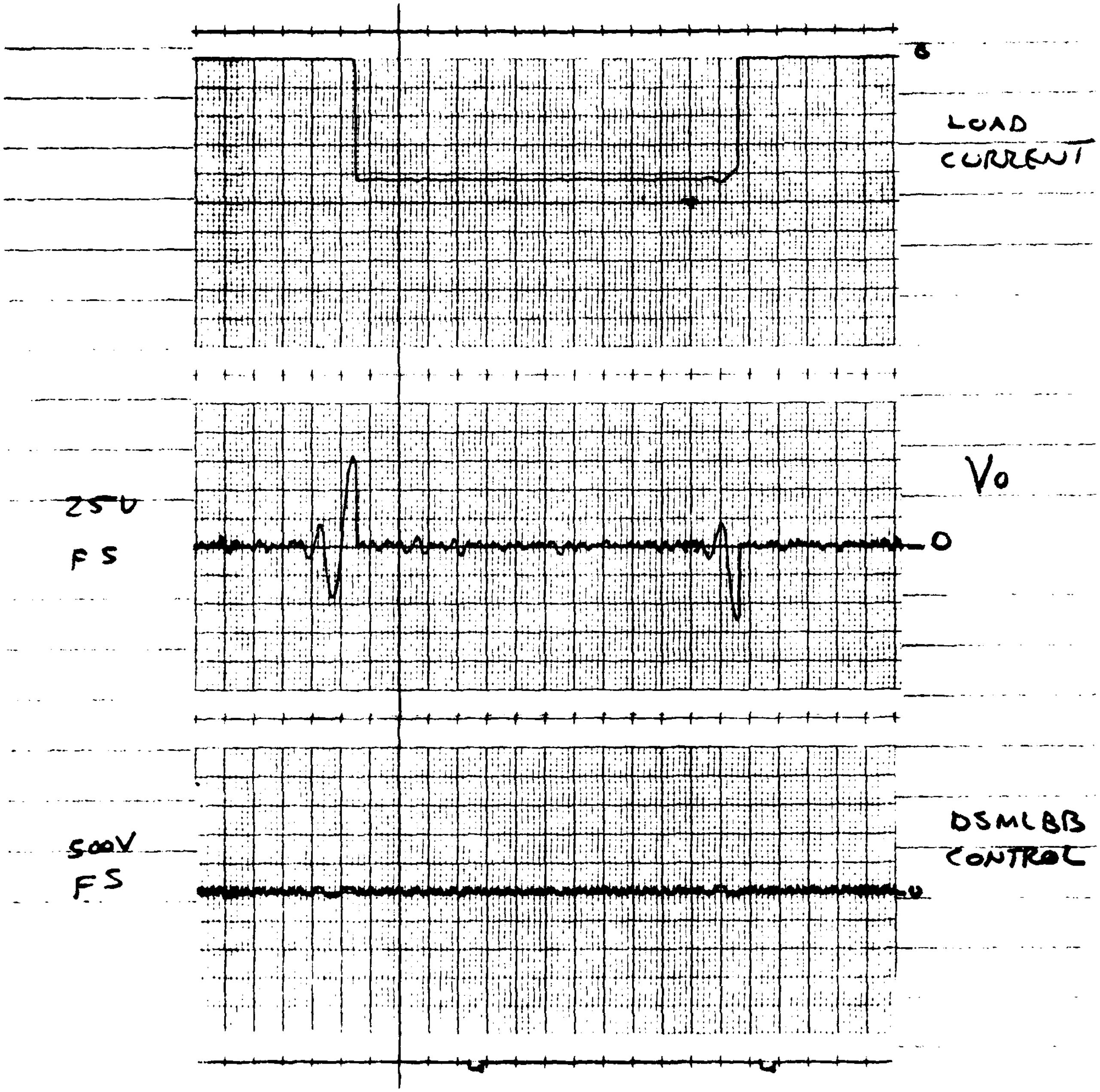


Figure 4-31. An Example of Direction Sensitive Multi-Level Bang-Bang Control

and monitoring functions? To answer these questions the analog regulator of Section 4.2 was studied. Based on this circuit, the PACER instruction times, and solution of the convolution integral at 100 samples, the controlling function could be updated at a rate of approximately 500 Hz and still maintain the monitor and diagnostic functions.

The additional hardware (over that required for the basic monitoring and diagnostic system) would be similar to that required for the MLBB circuit except that approximately 1500 words of additional memory would be needed. The total additional cost would be about $360.

4.4 HYBRID METHODS

Hybrid regulation is the combination of analog and digital regulation schemes. This study combined the analog methods described in Section 4.2 with the bang-bang and multiple level bang-bang schemes presented in Section 4.3.

Under steady state conditions the regulation would be provided by the analog regulator. However, under transient conditions, the digital regulator would provide control. Such a system provides smooth operation, fast regulation and efficient use of hardware. The smooth operation is provided through the use of the analog techniques. The fast regulation is provided through the use of the bang-bang techniques. Because the digital system is used only on demand in transient situations, the same digital hardware could conceivably be time shared with the monitor display and diagnostic functions.

Subroutine D of the flow chart in Figure 4.19b presents the method used for switching from the digital cortrol to a supplementary parallel controller such as an analog regulator. When the system is in steady state (output voltage within a programmed envelope), the supplementary regulator is in control. When a transient occurs, the digital system is switched into control.

4.4.1 Analysis of Hybrid Methods

The hybrid techniques are any combination of digital or analog techniques. Ideally, a hybrid technique has the advantages of the individual techniques but none of the disadvantages. Our study has not disproved this; however, we have discovered that hybrid techniques have a particular, although probably minor, problem - that of successfully switching from one technique to another. For example, in one simulation the combination of an analog technique with the bang-bang method would latch in the bang-bang mode. In this particular instance, once the system was placed into bang-bang mode, the analog system was permitted to drift freely; as a result the analog controller was never ready to resume control. This was corrected by forcing the analog regulator to follow the system in the bang-bang mode even though the analog regulator was not actually being used by the system.

4.5 MONITOR AND DIAGNOSTIC SYSTEM

Referring to Figure 4.1, the general microcomputer based controller will consist of: a microcomputer with a variety of digital and analog input/output devices. The analog inputs will include parameters to be monitored (current, frequency, voltage, oil level, etc.) and the diagnostic test points. Analog outputs will include field current control and other system controls. Digital inputs will include inputs from the operators console as well as diagnostic digital inputs. Digital outputs will include commands to the control circuits and control panel (e.g. alphanumeric display and indicator lamps).

4.5.1 Monitor System

The ideal monitoring system as described in Section 1.3 (Design Goals) was studied and a strategy was developed for its implementation.

An operator's display that fits the needs of the monitor design goals is presented as Figure 4-32. It consists of an alphanumeric display and several lighted key switches.

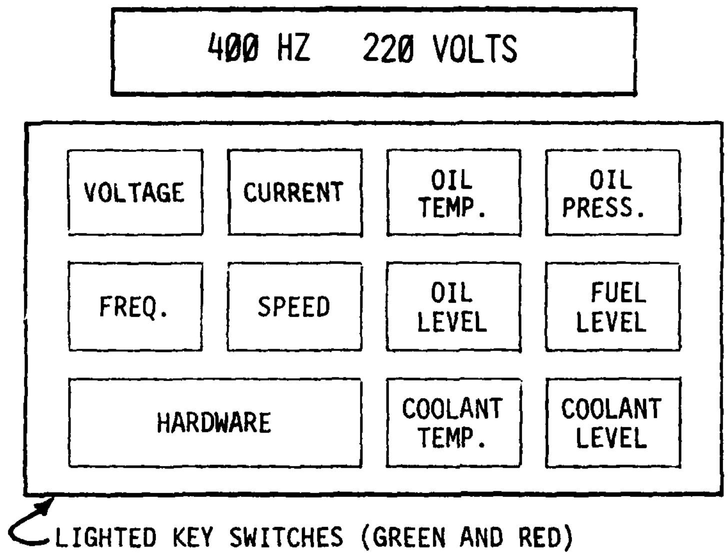


Figure 4-32. Operator's Display

The alphanumeric display is used to present quantitative operating instructions and information. The instructions would guide the operator in the use of the motor generator set and the diagnostic procedures. The quantitative information available for display would include the following:

- Voltage
- Current
- Frequency
- Speed
- Oil Temperature
- Oil Pressure
- Oil Level
- Fuel Level
- Coolant Temperature
- Coolant Level

Under normal conditions, the operator could command the system to display one or more of the parameters on the alphanumeric display. Under fault or near-fault conditions, the display would automatically present the parameters of interest along with any pertinent instructions for the operator (see Section 4.5.2 Diagnostics).

The key switches would have two purposes: To enter operator commands and to present the current status of the various parameters. For example, by pushing the voltage key, the value of the voltage will be presented on the alphanumeric display. If the voltage were within limits the voltage key switch would be green. If the voltage were beyond specified limits, the key switch would blink red. The key switches would also be capable of presenting warnings; for example, if the oil temperature suddenly changed although did not rise beyond the specified limits, the oil temp key switch would turn red. The operator could obtain more information by pressing the key switch. Pertinent information would be presented on the alphanumeric display.

4.5.2 Diagnostics

The exact method of detecting faults must be deferred until the hardware design has been finalized. However, a general strategy has been developed. As described in the design goals, the diagnostics will be of two

types: operating and non-operating.

The operating diagnostics will continuously check the following parameters:

Voltage
Current
Frequency
Speed
Oil Temperature
Oil Pressure
Oil Level
Fuel Level
Coolant Temperature
Cooland Level, and
Hardware

These are the same parameters presented on the key switch display. When the parameters are within specified limits, the diagnostic routine will set the key switch lamps to green. If any parameters go outside the specified limits, the key switch will turn red and the appropriate instructions will be presented to the operator. For example, if the fuel level is approaching empty, the fuel level lamp will turn red and the alphanumeric display may read "ADD FUEL". If any parameter goes beyond the specifications and into a state in which damage could occur, the key switch blinks red and the system takes appropriate action to eliminate the unsafe condition. For example, if the oil temperature were too high the system would automatically shut down.

These parameters can be combined to form a fault tree to aid in diagnosing specific faults. For example, by themselves, a rise in oil temperature and a change in oil level may not be faults; however, the simultaneous occurrence of the two may indicate an oil leak. This information could be passed on to the operator (condition red). If the situation worsens, the system may automatically shut down (condition blinking red). The change from red to blinking red may also be a function of time. For example, if the red condition lasts longer than t time, the condition is changed to blinking red.

The hardware function will continuously test various key hardware components. If a fault is detected appropriate action will be taken

automatically (e.g. shut down) and the alphanumeric display will indicate the location of the fault.

The diagnostics discussed thus far are performed while the system is actually in operation. If possible all the diagnostics should be incorporated into the operating system. However, complete diagnostics may actually require that the system be non-operating. For example, if the system contained digital read/write memory the best test is to write patterns into the memory and to compare what is read with what is written. This cannot easily be performed with the system in operation. Similarly, with analog portions of the system perhaps the system may best be checked by feeding the circuits known inputs which cannot be inserted during normal operation.

4.5.3 Analysis of Monitoring and Diagnostic Methods

The regulation schemes were evaluated based on the assumption that a microcomputer would exist in the controller for the monitoring and diagnostic functions. However, the functions as described in Sections 4.5.1 and 4.5.2 could also be accomplished through the use of discrete analog or digital design; or through the use of a minicomputer. The microcomputer could either be a purchased system (such as the Intel 80/100 single board computer) or a specially designed system based on a standard microprocessor family (such as the Intel 8080 family). The distinction between a minicomputer and a microcomputer is a fine one. The definition used in this study is that a minicomputer is closer to a general purpose computer and is therefore more user-oriented than a microcomputer. An example of a minicomputer is a PDP8. Figure 4.33 is a chart of the relative merits of each method.

The categories compared are: development costs; hardware costs; operational costs; flexibility; size and speed. These are considered as they fit the particular problem of controlling a motor generator.

The development costs for a minicomputer are the lowest, while the costs of the development of a custom microcomputer are the highest. As

	Discrete Design	Minicomputer	Standard Microcomputer	Custom Microcomputer
Development Costs	3	1	2	4
Hardware Costs	4	2	1	3
Operational Costs	3	2	1	4
Flexibility	4	2	1	3
Size and Weight	3	4	2	1
Speed	1	3	3	2
Average	3.6	2.8	2	3.4

Key: 1 = is best

4 = is worst

Figure 4-33. Evaluation Chart of Diagnostic and Monitoring Systems.

stated previously, a minicomputer is normally oriented towards the programmer and, therefore, the programming costs are minimized. Also the majority of the hardware design is standard. A commercial microcomputer system is very similar to a minicomputer except that the programming task may be higher because the system is hardware not software oriented.

The lowest hardware cost is expected to be a commercial microcomputer because a minimum system can be assembled from standard parts. The most expensive is expected to be the discrete design because of a greater number of parts and the largest construction costs.

Operational costs include training of operators and maintenance personnel; costs of maintenance and inventory. It is believed that a commercial microcomputer will have the lowest operational costs mainly because the hardware will consist largely of standard, inexpensive circuit boards or modules. The most expensive is expected to be the custom microcomputer. While the components of the custom microcomputer are standard, the basic configuration will be non-standard and, therefore, special maintenance procedures will need to be developed.

The standard microcomputer is believed to have the greatest flexibility in that it can be modified at a minimum cost while a discrete design will be the highest cost. For example, if requirements change for any part of the controller a standard microcomputer may compensate via software, or if software alone will not satisfy the requirement standard components from the microcomputer family can often be used. In a discrete design, however, hardware must always be changed and the changes are rarely minor.

Because a custom microcomputer is designed with the minimum parts, it will most likely be the smallest and lightest system. Analysis of the speed at which the regulator could operate shows that 300 Hz is acceptable if the monitor and display function can also be performed. In this case, all the systems are acceptable; however, the discrete design because it will be most likely perform most of the functions in parallel will be the fastest.

An unweighted average of the values presented in the chart indicates that the ranking should be as follows (best system first):

Standard microcomputer
Minicomputer
Custom microcomputer
Discrete design

5. CONCLUSIONS

The following conclusions have been drawn from this study:

1. Simulation of voltage regulation techniques has shown that either analog or digital methods can meet the regulation requirements of MIL-STD-704B. While the only digital method that actually fell within the specification during simulation was the NAVAIR bang-bang technique, the other digital techniques showed the flexibility of a computer based regulator. The simulations lead to the conclusions that the techniques can be optimized to meet the voltage regulation specification.

2. Digital techniques have the advantage over analog techniques. This is mainly due to the minimization of heat generation.

3. The best design method for meeting the diagnostic and monitoring goals is one based on standard microcomputers.

4. A microcomputer can perform all of the control tasks: regulation, diagnostic and monitoring.

6. RECOMMENDATIONS

The following recommendations are suggested as a result of this study:

1. The design of the AC-PAU controller should be based on a microcomputer system.
2. Saturating control should be the general technique of regulation.
3. The next phase of the program should be optimization of regulator design and the hardware implementation of the controller.

DETERMINATION OF CONSTANTS AND DEVELOPMENT OF TRANSFER CHARACTERISTICS

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TITLE AC-APU

LIST OF SYMBOLS

T_D = DIESEL ENGINE DEVELOPED TORQUE

J_D = DIESEL ENGINE INERTIA

Θ_D = DIESEL ENGINE SHAFT POSITION

K_S = SHAFT SPRING RATE

J_G = GENERATOR INERTIA

Θ_G = GENERATOR SHAFT POSITION

K_T = GENERATOR TORQUE CONSTANT

ϕ = GENERATOR FIELD FLUX

I_l = LOAD CURRENT

K_D = FRICTION DAMPING ON ROTATING SHAFT

S = LAPLACE TRANSFORM (d/dt)

$\left.\begin{array}{l} L_S = \text{STATOR} \\ R_S = \text{STATOR} \end{array}\right\}$ SYNCHRINOUS REACTANCE

L_l = LOAD INDUCTANCE

R_l = LOAD RESISTANCE

K_e = GENERATOR CONSTANT

E_G = GENERATED VOLTAGE

E_l = LINE VOLTAGE

K_f = GENERATOR FIELD GAIN CONSTANT

L_f = " " INDUCTANCE

R_f = " " RESISTANCE

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TITLE AC APU

L_{ex} = EXCITER INDUCTANCE

R_{ex} = " RESISTANCE

R_S = SPEED REGULATOR SOLENOID RESISTANCE

L_S = " " " INDUCTANCE

X_T = " " THROTTLE POSITION

K_{sr} = " " " RETURN SPRING

J_T = " " " INERTIA

K_D = " " " DAMPING

K_1 = GAIN TRANSFER OF T_D/X_T

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DEVELOPMENT OF EQUATIONS

1) $$T = (J_D s^2 + K_D s)\theta_D = (\theta_D - \theta_G)K_S = (J_G s^2 + K_T I \phi s)\theta_G$$

$$K_S \theta_D = (J_G s^2 + K_T I \phi s)\theta_G + K_S \theta_G$$

2) $$\theta_D = \left[\left(\frac{J_G}{K_S} s^2 + \frac{K_T I \phi}{K_S} s\right) + 1\right]\theta_G$$

SUBSTITUTING IN 1)

3) $$T = (J_D s^2 + K_D s)\left[\left(\frac{J_G}{K_S} s^2 + \frac{K_T I \phi}{K_S} s\right) + 1\right]\theta_G$$

4) $$\frac{s\theta_G}{T} = \frac{1}{K_D\left(\frac{J_D}{K_D} s + 1\right)\left[\frac{J_G}{K_S} s^2 + \frac{K_T I \phi}{K_S} s + 1\right]}$$

SINCE I & ϕ WILL BE VARIABLES

WE MUST BRING THESE OUT.

5) $$T - J_G s^2 \theta_G = K_T I \phi s \theta_G$$

THIS IS BASIC AND DOES NOT INCLUDE DIESEL CHARACTERISTICS.

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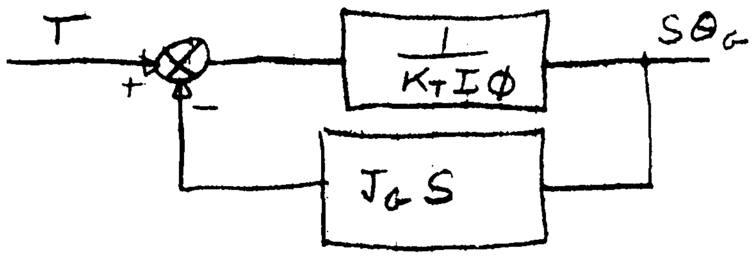
THIS CAN BE IN A FEEDBACK FORM



CHECKING THE LOOP WE HAVE

6) $$\frac{S\Theta_G}{T} = \frac{\frac{1}{K_T I \phi}}{1 + \frac{1}{K_T I \phi}\left(J_G S\right)} = \frac{1}{K_T I \phi + J_G S}$$

7) $$\frac{S\Theta_G}{T} = \frac{1}{K_T I \phi \left(\frac{J_G}{K_T I \phi} S + 1\right)}$$

EXPANDING WE FIND

$$T = J_G S^2 \Theta_G + K_T I \phi S \Theta_G$$

THIS CHECKS WITH 5)

THE GIMBAL CHARACTERISTICS MUST BE INCLUDED.

AD-A085 990 NAVAL AIR ENGINEERING CENTER LAKEHURST NJ GROUND SUPP--ETC F/G 10/2
APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT--ETC(U)
MAY 80 R F O'DONNELL
UNCLASSIFIED NAEC-92-139 NL

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A085990

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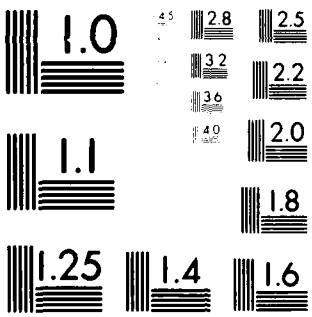

MICROCOPY RESOLUTION TEST CHART

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TITLE			

8) FROM 1)

$$T = (J_D s^2 + K_D s)\theta_D = (\theta_D - \theta_G) K_S$$

$$J_D s^2 \theta_D + K_D s \theta_D = K_S \theta_D - K_S \theta_G$$

EXPANDING 3)

9) $$\frac{T}{\theta_G} = \frac{J_D J_G}{K_S} s^4 + \frac{J_D K_T I \phi}{K_S} s^3 + J_D s^2 + \frac{J_G K_D}{K_S} s^3 + \frac{K_D K_T I \phi}{K_S} s^2 + K_D s$$

$$\frac{T}{s\theta_G} = \frac{J_D J_G}{K_S} s^3 + \frac{J_G K_D}{K_S} s^2 + J_D s + K_D + K_T I \phi s \left[\frac{J_D}{K_S} s + \frac{K_D}{K_S}\right]$$

10) $$\frac{T}{s\theta_G} = K_D \left[\frac{J_D J_G}{K_D K_S} s^3 + \frac{J_G}{K_S} s^2 + \frac{J_D}{K_D} s + 1\right] + \frac{K_D K_T I \phi}{K_S} s \left[\frac{J_D}{K_D} s + 1\right]$$

11) $$T - K_D \left[\frac{J_D J_G}{K_D K_S} s^3 + \frac{J_G}{K_S} s^2 + \frac{J_D}{K_D} s + 1\right] s\theta_G = \frac{K_D K_T}{K_S} (I\phi) s \left[\frac{J_D}{K_D} s + 1\right] s\theta_G$$

IN FEEDBACK FORM THIS IS:—

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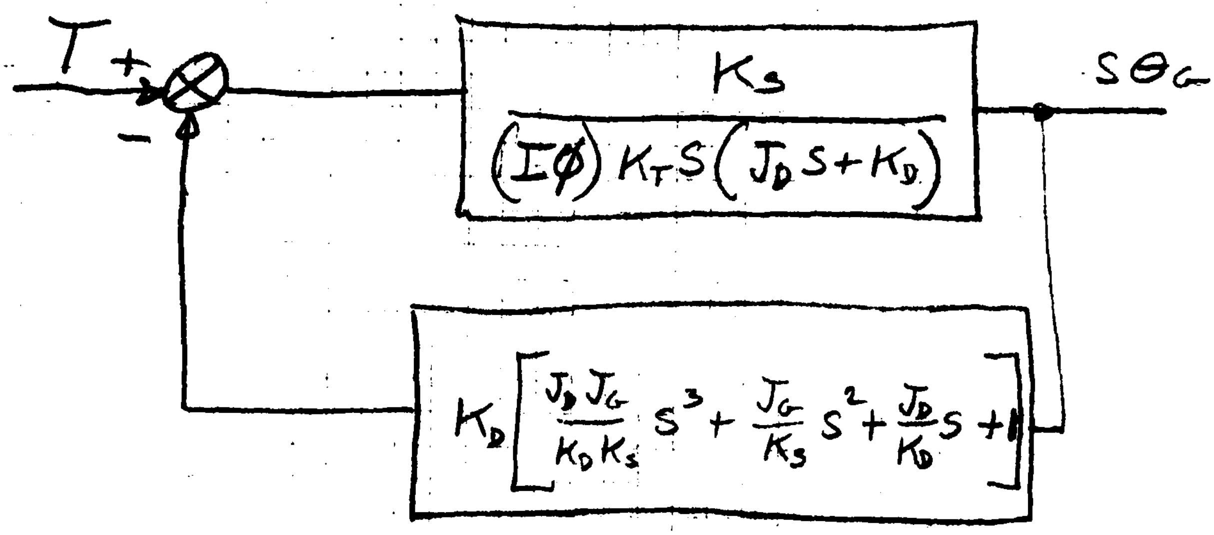

CHECKING THE LOOP WE HAVE:-

12) $$\frac{S\Theta_G}{T} = \frac{\dfrac{K_S}{S(K_T I\phi)(J_D S + K_D)}}{1 + \dfrac{K_S}{S(K_T I\phi)(J_D S + K_D)}\left(\dfrac{J_D J_G}{K_S}S^3 + \dfrac{J_G K_D}{K_S}S^2 + J_D S + K_D\right)}$$

13) $$\frac{S\Theta_G}{T} = \frac{K_S}{S K_T I\phi(J_D S + K_D) + \left[J_D J_G S^3 + J_G K_D S^2 + K_S J_D S + K_D K_S\right]}$$

14) $$\frac{S\Theta_G}{T} = \frac{1}{\left[\dfrac{J_D J_G}{K_S}S^3 + \left(\dfrac{J_D K_T I\phi + J_G K_D}{K_S}\right)S^2 + \left(\dfrac{K_T I\phi K_D}{K_S} + J_D\right)S + K_D\right]}$$

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THIS REDUCES TO

15) $$\frac{T}{S\theta_G} = \frac{J_D J_G}{K_S} S^3 + \frac{J_G K_D}{K_S} S^2 + J_D S + \frac{J_D K_T}{K_S} I\phi S^2 + \frac{K_D K_T I\phi}{K_S} S + K_D$$

16) $$\frac{T}{S\theta_G} = K_D \left[\frac{J_D J_G}{K_D K_S} S^3 + \frac{J_G}{K_S} S^2 + \frac{J_D}{K_D} S + 1 \right] + K_T I\phi \left[\frac{J_D}{K_S} S^2 + \frac{K_D}{K_S} S \right]$$

THIS CHECKS WITH 10)

17) THE TRANSFER CHARACTERISTIC OF THE ALTERNATOR FIELD IS

$$E_f \longrightarrow \boxed{\frac{K_f}{T_f S + 1}} \longrightarrow \phi$$

$$T_f = \frac{L_f}{R_f}$$

18) THE TRANSFER CHARACTERISTIC OF THE EXCITER IS

$$E_{ex} \longrightarrow \boxed{\frac{K_{ex}}{T_{ex} S + 1}} \longrightarrow E_f$$

$$T_{ex} = \frac{L_{ex}}{R_{ex}}$$

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19) THE ALTERNATOR INHERENT REGULATION IS EXPRESSED AS:-

$$E_l = E_G - I_l R_s$$

20) $$I_l = \frac{E_l}{R_l}$$

21) $$\frac{E_l}{E_G} = \frac{R_l}{R_l + R_s}$$

22) $$\frac{I_l}{E_G} = \frac{1}{R_s\left(\frac{L_s}{R_s} s + 1\right)}$$

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TITLE DETERMINATION OF CONSTANTS FOR AC-APU

1860 LB IN.	T_{D_1} = DIESEL ENGINE DEVELOPED TORQUE
930 LB IN.	T_{D_2} = DIESEL ENGINE TORQUE DUE TO COMPRESSION
12.763 LB-IN-SEC^2	J_D = DIESEL ENGINE INERTIA
	Θ_D = DIESEL ENGINE SHAFT POSITION
22.14 $\times 10^6$ LB IN/RAD	K_S = SHAFT SPRING RATE
12.37 LB IN SEC^2	J_G = GENERATOR INERTIA
	Θ_G = GENERATOR SHAFT POSITION
1.572 $\times 10^{-3}$ LB IN/A/LINE/in^2	K_T = GENERATOR TORQUE CONSTANT
10.95 $\times 10^3$ LINES/IN^2	ϕ = GENERATOR FIELD FLUX
83.27 A	I_f = FULL LOAD CURRENT
.1369 LB IN SEC	K_D = FRICTION DAMPING ON ROTATING SHAFT
	S = LAPLACE TRANSFORM (d/dt)
	$\left.\begin{matrix} L_s \\ R_s \end{matrix}\right\}$ EFFECTIVE GENERATOR IMPEDANCE
	$\left.\begin{matrix} L_\ell = \\ R_\ell = \end{matrix}\right\}$ LOAD IMPEDANCE
.091 $\times 10^{-3}$ V/rad/sec/lines/in^2	K_e = GENERATOR CONSTANT
208V	E_G = GENERATED VOLTAGE
	E_ℓ = LOAD VOLTAGE
385.84 lines/in^2/volt	K_f = GENERATOR FIELD GAIN CONSTANT
.2295 H	L_f = GENERATOR FIELD INDUCTANCE
1.72 Ω	R_f = GENERATOR FIELD RESISTANCE

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.46 H L_{ex} = EXCITER INDUCTANCE

2.4 Ω R_{ex} = " RESISTANCE

3.46 V/V K_{ex} = " VOLTAGE GAIN

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1) DIESEL ENGINE

HERCULES D-298-ER (76 HP)
RATED FOR 219 LB-FT @ 2000 rpm.
BSFC = .392 LB/BHP HR
#/HR = .392 x 83.5 = 32.73 LB/HR

THE ENGINE LOAD IS DETERMINED BY —

30 KW 1.00 P.F. 88.5% EFF

SHAFT LOAD = $\frac{30}{1 \times .885}$ = 33.9 KW , $\frac{33.9}{.746}$ = 45.44 HP

$T_G = \frac{45.44 \times 550 \text{ FT LB/SEC}}{209.3 \text{ RAD/SEC}} = 119.41$ LB FT.

F+W LOSSES [PAGE G-03, (183)] = 596.1 W
TOTAL LOSSES [PAGE G-03, (247)] = 3891 W

% F+W LOSSES $\frac{596.1 \times 100}{30000}$ = 1.99% = 2.376 LB FT.

FOR THE INITIAL RUNS THE TORQUE LIMIT WAS SET FOR 130% OF 119.41 OR 155 LB FT ≈ 1860 LB.IN.

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THE DECELERATION TORQUE IS DEVELOPED FROM THE KNOWN COMPRESSION RATIO OF THE ENGINE.

FOR THE WHITE ENGINE #DX-1678

COMPRESSION RATIO = 17.5:1

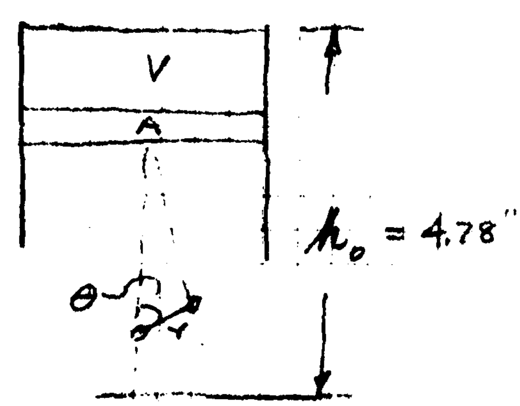
AIR INTAKE = 14.5 PSI

INCREASE IS $(17.5)(14.5) - 14.5 = 239.5$ PSI

STROKE = 4.5" $r = 2.25"$

BORE = 3.75" $A = \frac{\pi D^2}{4} = .785(14.05) = 11.03 \text{ in}^2$

T_D @ 2000 rpm = $154 \times 12 = 1850$ LB IN.



$$\frac{P_c}{P} = \frac{h_0 - r(1 - \cos\theta)}{h_0}$$

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$$T_{D_2} = Fr \sin\theta$$

$$F = \left[\frac{P_1}{P_0}(14.7) - 14.7\right] A$$

$$F = 162\left[\frac{P_1}{P_0} - 1\right]$$

$$\therefore \quad T_{D_2} = 364.5\left[\frac{P_1}{P_0} - 1\right]\sin\theta$$

θ	$\frac{P_1}{P_0}$	F	T_D
0°	1.0	0	0
30°	1.068	11	12.4 LB IN
60°	1.308	49.9	97.3
90°	1.99	160	360
120°	3.3	372	725
150°	8.25	1338	1505
180°	17.1	2610	0

USING AN AVERAGE VALUE WE HAVE .636 × 1505 = 957 LB IN

FOR SIMULATION USE A RATIO OF 2:1 FOR DEVELOPED TORQUE TO COMPRESSION TORQUE

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DIESEL ENGINE INERTIA (J_D)
HERCULES MODEL D-298-ER

MASSES: -

.036 + .235 + .143 + .21 + .21 + .143 + .236 + 11.76

TOTAL = 12.763 LB. IN. SEC^2

SHAFT SPRING RATE (K_S)

$K_S = 82.94 \times 10^6$ LB IN/RAD.

GENERATOR INERTIA (J_G)

30 KW 400 HZ

MASSES: -

12.03 + .34

TOTAL = 12.37 LB. IN SEC^2

2) GENERATOR TORQUE CONSTANT (K_T)

$$K_T = \frac{T_G}{I_f \phi} = \frac{119.41}{83.27\,(10.95\times10^3)} = .131\times10^{-3}\ \frac{\text{LB IN}}{\text{A / FL}}$$

$K_T = 1.572 \times 10^{-3}$ LB IN/A/LINE OF FLUX

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			C4258-06
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3) FRICTION DAMPING ON ROTATING SHAFT

F+W LOSSES (SEE PAGE 2)

F+W = 2.376 LB FT.

$$K_D = \frac{2.376 \text{ LB FT}}{209.3 \text{ RAD/SEC}} = .0114 \text{ LB FT} \frac{\text{SEC}}{\text{RAD}}$$

$$K_D = .1369 \text{ LB IN} \frac{\text{SEC}}{\text{RAD}}$$

4) GENERATOR CONSTANT (K_e)

$E_G = 208$ VOLTS

$$S\Theta_G = 2000 \frac{\text{rev}}{\text{min}} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{2\pi \text{ rad}}{\text{rev}} = 209.3 \text{ rad/sec}$$

$$K_e = \frac{E_G}{S\Theta_G \phi} = \frac{208}{(209.3)(10.95 \times 10^3)}$$

$$K_e = .091 \times 10^{-3} \text{ V/rad/sec/lines/in}^2$$

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5) GENERATOR FIELD CONSTANT. (K_f)

$$K_f = \frac{\phi}{E_f}$$

FROM FIELD SATURATION CURVE

$E_a = 416V$

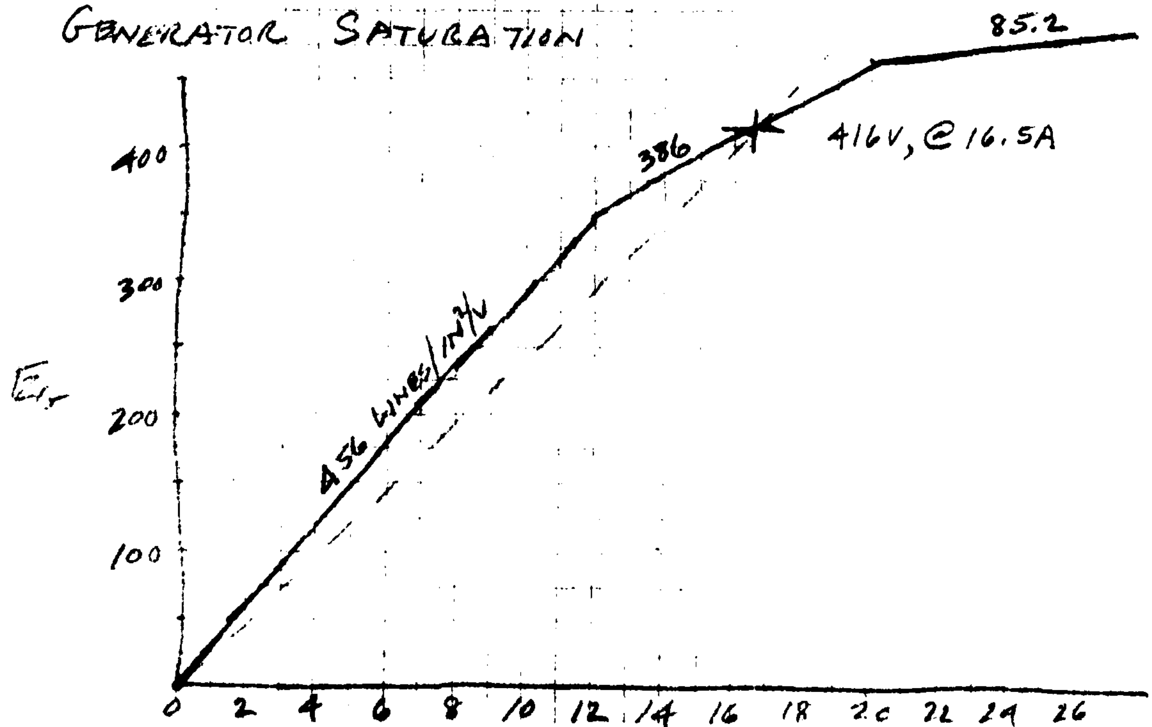
$I_F = 16.5A$

$R_F = 1.72\ \Omega$

$E_f = 16.5 \times 1.72 = 28.38\ V$

$$\therefore K_f = \frac{10.95 \times 10^3}{28.38} = 385.84 \text{ lines/in}^2\text{/volt}$$

GENERATOR SATURATION



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SIMULATION OF SATURATION BY 2 BREAKS. (FROM GEN. CURVE 37.5KVA 400HZ)

1ST SLOPE

$$\frac{478}{405} \times 386 = \underline{456} \text{ LINES/IN}^2/\text{V}$$

BREAK @ 330V

$$\phi = \frac{330}{416} \times 10.95\times10^3 = 8.7\times10^3 \text{ LINES/IN}^2$$

2nd SLOPE

$$\left(\text{FOR } 386 \text{ LINES/IN}^2/\text{V} \;=\; \frac{197}{8\times1.72} = 14.32\text{V/V}\right)$$

$$\frac{122}{8\times1.72} = 8.86 \text{ V/V}$$

$$\frac{8.86}{14.32} \times 386 = \underline{239} \text{ LINES/IN}^2/\text{V}$$

BREAK @ 455V

$$\phi = \frac{455}{416} \times 10.95\times10^3 = 12\times10^3 \text{ LINES/IN}^2$$

3rd SLOPE

$$\frac{87}{16\times1.72} = 3.16 \text{ V/V}$$

$$\frac{3.16}{14.32} \times 386 = \underline{85.2} \text{ LINES/IN}^2/\text{V}$$

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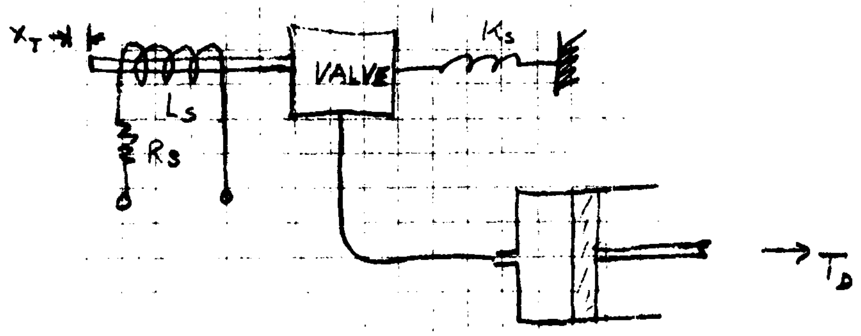
6) GOVERNOR FOR DIESEL ENGINE

ELECTRICAL INPUT TO GOVERNOR WILL CAUSE THROTTLE VALVE TO MOVE A DESIRED AMOUNT.



TRANSFER CHAR. OF SOLENOID

$$F_S = NI = J s^2 X_T + K_D X_T + K_S X_T$$

$$E = I\,(R_s + s L_s)$$

$$\frac{I}{E} = \frac{1}{R_s\left(\frac{L_s}{R_s}s+1\right)}$$

$$\frac{NI}{E} = \frac{N}{R_s\left(\frac{L_s}{R_s}s+1\right)} = \frac{F_s}{E}$$

$$\therefore \quad \frac{X_T}{NI} = \frac{1}{K_s\left(\frac{J}{K_s}s^2 + \frac{K_D}{K_s}s + 1\right)}$$

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ENGINE TORQUE

$$T_D = PA$$

$$Q = A(SX_P) \qquad \frac{Q}{A} = SX_P$$

$$SX_P = KS\theta_D \qquad A = \frac{Q}{KS\theta_D}$$

$$\therefore T_D = P\left(\frac{Q}{KS\theta_D}\right)$$

FROM INFORMATION ON WHITE DIESEL ENGINE MODEL D-2300 WE FIND A RELATION OF TORQUE VS LBS. OF FUEL/HR AT SPECIFIC SHAFT SPEEDS. FOR OUR SIMULATION WE WILL USE A CONSTANT. THE ACTUAL RELATION IS:-

SINCE $Q = K_T X_T$

$$T_D = \frac{P}{K}\left(\frac{K_T X_T}{S\theta_D}\right)$$

$$\frac{T_D}{X_T} = \frac{K'}{S\theta_D}$$

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FROM LUCAS (MARCH 10, 1976) ARTICLE OF GOVERNING OF OIL ENGINES PAGE 23, THE CONTROL ROD OPENING VARIES FROM 2 - 8 mm.

FOR FULL OPEN THROTTLE WE WILL USE

$$X_T = \frac{.8\,cm}{2.54\,cm}\,in \doteq .315\ IN.$$

THE ENGINE CONSTANT (K_1) WILL BE EXPRESSED AS.

$$K_1 = \frac{T_D}{X_T} = \frac{119.41}{.315}\left(\frac{12\ IN}{FT}\right)$$

$$K_1 = 4550\ \frac{LB.IN.}{IN.}$$

ASSUME A COIL POWER LEVEL : 30W

$$I = \frac{30W}{28V} = 1.07A$$

$$R_s = \frac{28}{1.07} = 26.13\,\Omega$$

FORM ... (4 CP)

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ALSO ASSUME A TIME CONSTANT OF $\tau = .015$

$$\tau = \frac{L_s}{R_s} = .015 = \frac{L_s}{26.13}$$

$$L_s = .392\ H$$

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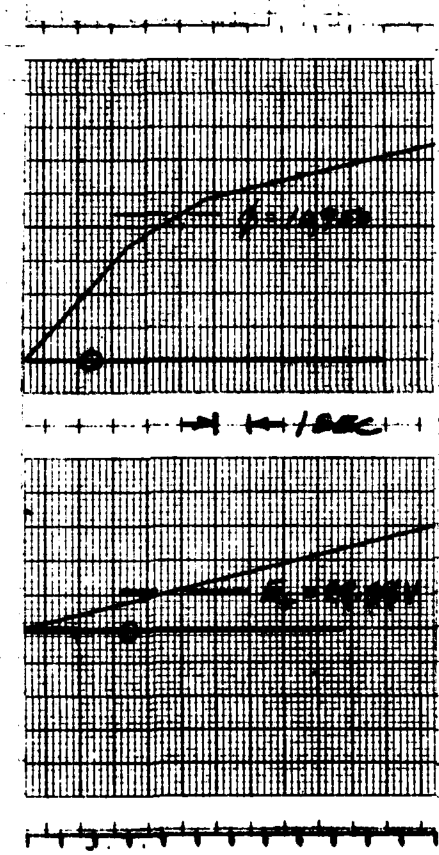
SIMULATION OF ALTERNATOR FIELD SATURATION



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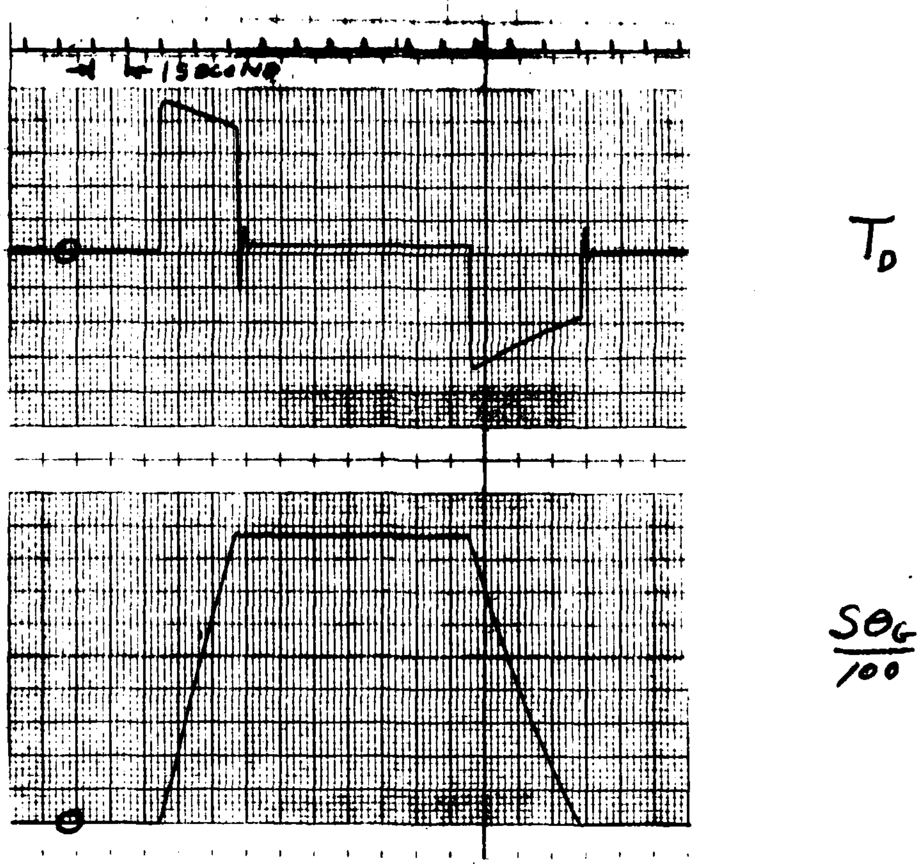
EFFECT OF TORQUE LIMIT
ON SIMULATION OF
DIESEL ENGINE
START UP AND SHUT DOWN



FORM 207-10M-4-74-CP

COMPUTERIZED LITERATURE SEARCHES
ON THE SUBJECT OF REGULATION DESIGN

User 244 Date:03/25/76 Time:06:00:44 File: 8

Set	Items	Description
1	878	ELECTRIC MACHINERY
2	560	ELECTRIC GENERATORS
3	11	ELECTRIC MOTOR GENERATOR SETS
4	1417	1-3/OR
5	2932	CONTROL SYSTEMS
6	0	BANG BANG
7	15083	DIGITAL
8	419	PREDICTIVE
9	3416	PROPORTIONAL
10	0	SAMPLED DATA
11	18699	7-10/OR
12	1	4 AND 5 AND 11
13	8	4 AND 5
14	21	COMPUTER SYSTEMS
15	0	4 AND 14
16	741	COMPUTER SYSTEMS, DIGITAL
17	0	4 AND 16

Print 13/5/1-8

Search Time: 15.42 Prts.: 8 Descs.: 9

ID NO.- EI750850836 550836
SELECTION OF OPTIMAL PARAMETERS FOR AN AUTOMATIC GENERATION CONTROL SYSTEM.
Ramamoorty, M.; Kibe, A. V.
Indian Inst of Technol, Kanpur
DESCRIPTORS- *CONTROL SYSTEMS, ELECTRIC GENERATORS, (MATHEMATICAL TECHNIQUES, Linearization),
CARD ALERT- 731, 705, 921
CODEN- JEELAC SOURCE- J Inst Eng (India) Electr Eng Div v 55 pt EL 3 Feb 1975 p 129-133
The system provides proper input signals to each area controller to minimize the deviations in frequency and tie line power due to any sudden disturbance in the system by loss of generation or load variation. Concept of minimum settling time to obtain optimum gains for the controller inputs is used. The system sensitivity for different parameters is also investigated. 4 refs.

ID NO.- EI750637327 537327
THYRISTOR PULSE-FREQUENCY CONTROL SYSTEMS FOR ELECTRICAL MACHINES.
Lifanov, S. V.; Morgovskiy, Yu. Ya.
DESCRIPTORS- (*ELECTRIC MACHINERY, *Control Systems), PULSE TIME MODULATION,
CARD ALERT- 705, 716, 731
CODEN- SAUCBZ SOURCE- Sov Autom Control v 7 n 5 Sep-Oct 1974 p 62-66
Discussed are pulse-frequency control systems for electrical machines, using thyristor pulse shapers, intended for speed regulation of dc motors and control of synchronous generator voltages. It is shown that by using pulse-frequency modulation instead of pulsewidth modulation, it is possible to reduce the commutation losses and simplify the instrumentation. The problem of determining the parameters of a modulator that minimizes the commutation losses is examined. 8 refs.

ID NO.- EI750208798 508798
OB USTROICHIVOSTI KOMBINIROVANNYKH SISTEM AVTOMATICHESKOGO REGULIROVANIYA ELEKTRICHESKIKH MASHIN. $left bracket$ Stability of Combined Control Systems of Electric Machines $right bracket$.
Lekakh, M. N.
DESCRIPTORS- (*ELECTRIC MACHINERY, *Control Systems), (CONTROL SYSTEMS, Invariance), SYSTEM STABILITY,
CARD ALERT- 705, 731
CODEN- ELKTAQ SOURCE- Elektrotekhnika n 11 Nov 1974 p 39-43
It is shown that automatic control by dependent disturbances in the class of systems designed in accordance with the combined principle of control results in a change in the characteristic equation and, consequently, in the dynamic properties of the system. In Russian.

ID NO.- EI741169341 469341
USTROISTVO DLYA KONTROLYA SOSTOYANIYA SISTEMY NEPOSREDSTVENNOGO VODYANOGO OKHLAZHDENIYA OBMOTKI STATORA SINKHRONNYKH GENERATOROV. $left bracket$ Device for Controlling the State of the System of Direct Cooling by Water of the Synchronous Generator Stator Winding $right bracket$.
Vainshtein, R. A.; Getmanov, V. T.; Chikunov, A. G.
Tomsk Polytech Inst im. S. M. Kirov, USSR
DESCRIPTORS- (*ELECTRIC GENERATORS, *Protection), (ELECTRIC MACHINERY, Cooling), CONTROL SYSTEMS,
CARD ALERT- 701, 705, 731
CODEN- IVZEAY SOURCE- Izv Vyssh Uchebn Zaved, Energ n 7 Jul 1974 p 9-12
The necessity for and the usefulness of technical development of devices permitting control of the state of the system of cooling of stator windings of synchronous generators, with direct cooling by water, is demonstrated. Problems of development of a device of this kind utilizing electric values with the frequency of 25 Hz are set forth. This device is to be introduced into the primary circuit of the generator to implement failure-proof protection against short-circuiting to the ground. In Russian.

ID NO.- EI741061916 461916
O KLASSIFIKATSII ELEKTRICHESKIKH MASHIN DLYA SISTEM AVTOMATICHESKOGO UPRAVLENIYA. $left bracket$ Classification of Electric Machines for Automatic Control Systems $right bracket$.
Batovrin, A. A.; Titov, N. P.
DESCRIPTORS- (*ELECTRIC MACHINERY, *Control), CONTROL SYSTEMS, (INFORMATION SCIENCE, Classification),
CARD ALERT- 705, 731, 901
CODEN- IVUEA9 SOURCE- Izv Vyssh Uchebn Zaved, Elektromekh n 5 May 1974 p 539-546
Problems of classification of electric machines working in automatic control systems are considered. Division of all machines into power and information machines is proposed. A classification table is given of the main elements of automatic control systems with their transfer and transition functions. Each element is exemplified in the table by one or more types of electric machines. In Russian.

ID NO.- EI740313337 413337
DAS DONAUKRAFTWERK OTTENSCHEIM-WILHERING. $left bracket$ Ottensheim-Wilhering Hydroelectric Power Plant on the Danube $right bracket$.
Anon
DESCRIPTORS- (*HYDROELECTRIC POWER PLANTS, *Austria), (HYDRAULIC TURBINES, Tubular), (ELECTRIC GENERATORS, Hydroelectric), (RIVER BASIN PROJECTS, Austria), CONTROL SYSTEMS, ELECTRIC POWER SYSTEMS,
CARD ALERT- 402, 441, 611, 632, 706, 731
CODEN- OEZOBC SOURCE- OZE Oesterr Z Elektr v 26 n 10 Oct 1973 p 397-542
The entire issue of the journal is devoted to the new hydroelectric power plant on the Danube in Austria which is to be put into service at the end of 1973. This is the fourth multipurpose project built in Austria, utilizing water resources of the Danube. The total of 25 articles is divided into 6 sections. The first section contains a general article about the turbine types at Austrian hydroelectric power plants and on special problems of the new Kaplan tubular turbine, and an article comparing the present project with its immediate predecessor. The second section (10 articles) deals with general planning and construction work with a detailed article on the project, on the tubular turbine, etc. The third section (7 articles) dealing with mechanical engineering and electrical engineering work describes the turbine unit, turbine controllers, power generation equipment, high voltage equipment, control equipment, etc. The fourth part (2 articles) describes the hydraulic steel structures, such as locks. The fifth part (3 articles) deals with maintenance and management problems. The last part contains the most important factual data about the plant and its construction. In German.

ID NO.- EI740312291 412291
ISSLEDOVANIE TSIFROVOI SISTEMY AVTOMATICHESKOGO REGULIROVANIYA NAPRYAZHENIYA GENERATORA. $left bracket$ Investigation of a Digital System of Automatic Control of Generator Voltage $right bracket$.
Serkov, V. I.; Solov'ev, V. N.
DESCRIPTORS- (*ELECTRIC GENERATORS, *Control Systems), (CONTROL, ELECTRIC VARIABLES, Voltage), CONTROL SYSTEMS, DIGITAL,
CARD ALERT- 731, 706, 715, 705, 701
CODEN- IVUEA9 SOURCE- Izv Vyssh Uchebn Zaved, Elektromekh n 9 Sep 1973 p 966-970
A digital controller is proposed for maintaining generator voltage. On the basis of a proposed diagram of stability and quality, constructed in the space of the coefficients of the characteristic equation of a closed system, parameters are selected for the algorithm of a digital computer. Recommendations are given for meeting various technical requirements with respect to the control system of generator voltage. In Russian.

ID NO.- EI730101275 301275

POWER SYSTEM GENERATOR STABILITY USING STATE SPACE TECHNIQUES.

Webb, A. J.; Sheard, G.
The Electricity Commission of New South Wales, Sydney

DESCRIPTORS- (*ELECTRIC GENERATORS, *Control), CONTROL SYSTEMS,
CARD ALERT- 705, 731

CODEN- PRAUA6 SOURCE- Proc Inst Radio Electron Eng, Australia v 33 n 5 May 1972 p 182-186

The stable operation of the generators in a large electric power system can be substantially improved by using supplementary signals in addition to terminal voltage as feedback information to the generators' automatic excitation regulators. The selection and conditioning of available signals has been investigated by applying linear state space techniques to the generators and their excitation systems and stability and damping assessed by examination of the eigenvalues of the state matrix. 14 refs.

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Set	Items	Description
1	3	ELECTRIC MACHINERY
2	213	ELECTRIC GENERATORS
3	0	ELECTRIC MOTOR GENERATOR SETS
4	216	1-3/OR
5	2112	CONTROL SYSTEMS
6	7	BANG BANG
7	21600	DIGITAL
8	235	PREDICTIVE
9	932	PROPORTIONAL
10	26	SAMPLED DATA
11	22690	6-10/OR
12	0	4 AND 5 AND 11
13	2	4 AND 5
14	1	4AND 11
15	261	COMPUTER SYSTEMS
16	0	4AND15
17	0	VOLTAVGE
18	6396	SPEED
19	38	RPM
20	6423	17-19/OR
21	12633	VOLTAGE
22	18714	20 OR 21
23	1263	REGULATOR
24	125	GOVERNOR
25	54765	CONTROL
26	55173	23-25/OR
27	857	ENGINE
28	4807	GENERATOR
29	19	ROTATING MACHINERY
30	39	ALTERNATING CURRENT
31	5679	27-30/OR
32	8881	SWITCHING
33	1	PROPORTIONAL BAND
34	8882	32 OR33
35	9810	6 OR 9 OR 34
36	286	22 AND 26 AND 31
37	14	35 AND 36
38	36	22 AND 31 AND 35
39	41580	COMPUTER
40	21600	DIGITAL
[illegible]	238	MICPOPROCESSOR
[illegible]	0	MICRO PROCESSOR
[illegible]	1150	MINICOMPUTER
[illegible]	1	MICRO(W)PROCESSOR
	6658	39-44/OR
	869	[illegible]AND45
	[illegible]	34AND45AND35
	28	31AND45AND35
	[illegible]	27OR29OR30
	[illegible]	[illegible]

859736 C7604562
AN APPLICATION IN ENGINE TESTING
LOWRES, E.J. ; GEC-ELLIOTT PROCESS AUTOMATION, BOREHAMWOOD, ENGLAND
MINICOMPUTER FORUM 585-600 1975
11-13 FEB. 1975 LONDON, ENGLAND
PUBL: ONLINE UXBRIDGE, MIDDX., ENGLAND
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, INTERNAL COMBUSTION ENGINES
IDENTIFIERS: ENGINE TESTING, AUTOMATION EQUIPMENT, MINICOMPUTER, SOFTWARE PACKAGE CONRAD, INTERNAL COMBUSTION ENGINE TESTING, QUALITY CONTROL
SECTION CLASS CODES: C8847
UNIFIED CLASS CODES: WMEMAD
THE TESTING OF INTERNAL COMBUSTION ENGINES IN MANY WAYS LENDS ITSELF TO AUTOMATION BUT IT HAS BEEN FOUND THAT STANDARD MINI COMPUTER :AUTOMATION: PACKAGES FALL SHORT IN THIS APPLICATION. THE PAPER DESCRIBES THE BASIC REQUIREMENTS OF THE AUTOMATION EQUIPMENT AND ILLUSTRATES THESE BY GIVING AN EXAMPLE OF A TYPICAL TEST PERFORMED ON AN ENGINE. THE APPLICATION OF A MINICOMPUTER TO PERFORM THESE FUNDAMENTAL REQUIREMENTS HAS LED TO THE DEVELOPMENT OF A SOFTWARE PACKAGE CONRAD. IT IS SHOWN HOW CONRAD MEETS THE PRIME REQUIREMENTS, PROVIDING THE ENGINEER WITH A FACILITY BY WHICH HE CAN MAKE BASIC CHANGES TO THE WAY IN WHICH AN ENGINE IS TESTED WITHOUT RESORTING TO USING A PROGRAMMER

859721 B7606229, C7604547
THE MEASUREMENT OF AVERAGE INDICATOR DIAGRAMS BY A MINICOMPUTER AIDED DATA ACQUISITION SYSTEM
KONTANI, K. ; MECH. ENGNG. LAB., AGENCY OF INDUSTRIAL SCI. AND TECHNOL., IGUSA SUGINAMI-KU, TOKYO, JAPAN
J. MECH. ENG. LAB. (JAPAN) VOL.29, NO.3 92-108 MAY 1975
CODEN: KGKSBL
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, DATA ACQUISITION , INTERNAL COMBUSTION ENGINES
IDENTIFIERS: AVERAGE INDICATOR DIAGRAMS, MINICOMPUTER AIDED DATA ACQUISITION SYSTEM, CONTINUOUS ENGINE CYCLES, IGNITION TIMING, PRECISE MEASUREMENT
SECTION CLASS CODES: C8847, B4270, C7660
UNIFIED CLASS CODES: WMEMAD, BECRAX
LANGUAGE: JAPANESE
THE SYSTEM YIELDS A MEAN PRESSURE TRACE FOR A CERTAIN NUMBER OF CONTINUOUS ENGINE CYCLES AND, AT THE SAME TIME, RECORDS THE MAXIMUM PRESSURE, THE MAXIMUM RATE OF PRESSURE RISE AND THE IGNITION TIMING OF EACH CYCLE, THUS ACCOMPLISHING A PRECISE MEASUREMENT OF AN INDICATOR DIAGRAM. THE DETAILED DESCRIPTION OF THE METHOD AS WELL AS THE DISCUSSION OF THE PROBLEMS ACCOMPANYING THE AVERAGING TREATMENT ARE SHOWN (4 REFS)

858815 B7607584, C7603563
DRIVING SIMULATOR FOR FAST TRAINS
CARMINATI, E.
TECNOL. ELETTR. (ITALY) NO.6 72-7 JUNE 1975
DESCRIPTORS: RAILWAYS, SIMULATION, TRAINING, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: FAST TRAINS, ENGINE CONTROLS, SIGNAL VISUALISATION, NOISE SIMULATION, DRIVING SIMULATOR, COMPUTER CONTROL
SECTION CLASS CODES: B5620, B1220, C7872, C7600, C8846
UNIFIED CLASS CODES: TKEAAR, ADCAAP, VMREAK, VKZAAS, WMEKAS
LANGUAGE: ITALIAN
TRAINING FOR DRIVERS OF TRAINS OF 200 KM/H REQUIRES EXPERIENCE SUPPLEMENTED BY PRACTICE IN A SIMULATOR AS IN THE TRAINING OF AIR-PILOTS. A SIMULATOR MADE BY E. MARELLI CO. FOR THE ITALIAN RAILWAYS IS DESCRIBED; IT PROVIDES FOR DRIVING IN DAY AND NIGHT CONDITIONS, ENGINE CONTROLS AND SAFETY MATTERS, SIGNAL VISUALISATION AND NOISE SIMULATION, DATA GENERATION, SUPERVISION AND RECORDING OF DRIVER PERFORMANCE. THE SIMULATOR IS CONTROLLED BY A PDP/8/E COMPUTER

858548 C7603265
CONTROL SYSTEM OF THE ANALOGUE-DIGITAL-ANALOGUE TYPE WITH A DIGITAL COMPUTER HAVING MULTIPLE FUNCTIONS FOR AN AUTOMATIC VEHICLE
RIVERE, J.-P., BERTUOL, B., LEICHLE, C.
PATENT NO.: USA 3906207 ASSIGNEES: REGIE NAT. USINES RENAULT, AUTOMOBILES PEUGEOT FILED: 10 MAY 1973
ORIGINAL PATENT APPL. NO.: FRANCE 72.16823
PRIORITY DATE: 10 MAY 1972
16 SEPT. 1975
DESCRIPTORS: AUTOMOBILES, ENGINES, DIGITAL CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, ANALOGUE-DIGITAL CONVERSION, DIGITAL-ANALOGUE CONVERSION
IDENTIFIERS: DIGITAL COMPUTER, MULTIPLE FUNCTIONS, AUTOMATIC VEHICLE , 10 BINARY DIGITS, A/D/A CONTROL SYSTEM, ENGINE CONTROL
SECTION CLASS CODES: C7851, C8846
UNIFIED CLASS CODES: VMKCAD, WMEKAS
ENGINE CONTROL SIGNALS ARE CALCULATED BY A UNIT CAPABLE OF MULTIPLYING AND ADDING TWO NUMBERS OF UP TO 10 BINARY DIGITS AND STORING THE SUM IN A READ-WRITE MEMORY

858408   A76075I5, B7606350, C7603100
DIGITAL QUARTZ TRANSDUCERS FOR ABSOLUTE PRESSURE MEASUREMENTS
PAROS, J.M.   ; PAROSCI. INC., REDMOND, WA, USA
WASHBURN, B.
; ISA
STD BOOK NO.: 0 87664 261 X
PROCEEDINGS OF THE 21ST INTERNATIONAL INSTRUMENTATION SYMPOSIUM
435-42   1975
19-21 MAY 1975   ISA   PHILADELPHIA, PA., USA
PUBL: ISA   PITTSBURGH, PA., USA
DESCRIPTORS: PRESSURE TRANSDUCERS, PRESSURE MEASUREMENT
IDENTIFIERS: ABSOLUTE PRESSURE MEASUREMENTS, QUARTZ CRYSTAL SENSING ELEMENT, OCEANOGRAPHY, METEOROLOGY, JET ENGINE TESTING, PROPULSION CONTROL SYSTEMS, AIR DATA COMPUTERS, LABORATORY PRESSURE STANDARDS, DIGITAL QUARTZ TRANSDUCERS
SECTION CLASS CODES: B4449, C7449, B4250, C7630, A0630
UNIFIED CLASS CODES: BKETAH, BECMAA, BGGAAV
THE CONSTRUCTION, OPERATION, AND PERFORMANCE OF A SERIES OF ABSOLUTE PRESSURE TRANSDUCERS WHICH EMPLOY A SPECIAL QUARTZ CRYSTAL SENSING ELEMENT ARE DESCRIBED. THE RESONANT FREQUENCY OF THE QUARTZ CRYSTAL VARIES WITH PRESSURE INDUCED STRESS AND THE ULTRA-HIGH VACUUM IN WHICH THE RESONATOR OPERATES IS USED AS THE ABSOLUTE PRESSURE REFERENCE. BECAUSE OF THEIR DIGITAL-TYPE OUTPUT, HIGH ACCURACY, LOW POWER CONSUMPTION, AND INSENSITIVITY TO ENVIRONMENTAL ERRORS, THESE INSTRUMENTS HAVE BEEN USED SUCCESSFULLY IN SUCH DIVERSE FIELDS AS OCEANOGRAPHY, METEOROLOGY, JET ENGINE TESTING PROPULSION CONTROL SYSTEMS, AIR DATA COMPUTERS, AND LABORATORY PRESSURE STANDARDS (3 REFS)

847735   C7602019
DIGITAL COMPUTING TECHNIQUES IN THE MANUFACTURE AND OPERATION OF ENGINE MANAGEMENT SYSTEMS
DAVIES, R.J.   ; LUCAS AEROSPACE LTD., SOLIHULL, ENGLAND
AERONAUT. J. (GB)   VOL.79, NO.776   349-53   AUG. 1975   CODEN: AENJAK
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE ENGINES, AUTOMATIC TESTING, MANUFACTURING ADMINISTRATIVE DATA PROCESSING
IDENTIFIERS: ENGINE MANAGEMENT SYSTEMS, DIGITAL TECHNIQUES, ENGINE CONTROL, STORE INFORMATION, SELF TEST PROGRAMMES, INTERNAL FAULT DIAGNOSIS
SECTION CLASS CODES: C8849, C7875, C8670
UNIFIED CLASS CODES: WMEZAN, VMRMAY, WKKAAH
INTRODUCES THE DIGITAL TECHNIQUES IN ENGINE CONTROL LEADING TO MANY ADVANTAGES. THE ABILITY OF DIGITAL SYSTEMS TO STORE INFORMATION MEANS THAT CALIBRATION AND TEST PROGRAMMES CAN BE PERFORMED USING INFORMATION DERIVED FROM THE EARLY STAGES OF PRODUCTION. WIDE RANGING SELF TEST PROGRAMMES CAN ALSO BE INCLUDED, AS CAN DIAGNOSIS OF INTERNAL FAULTS

847731 C7602015

COMPUTER AIDED DESIGN OF THE EXHAUST OF A TURBOCHARGED DIESEL ENGINE

LEDGER, J.D. ; INST. OF SCI. AND TECHNOL., UNIV. OF MANCHESTER, MANCHESTER, ENGLAND

STD BOOK NO.: 0 903796 06 6
INTERACTIVE SYSTEMS 171-81 1975
SEPT. 1975 LONDON, ENGLAND
PUBL: ONLINE UXBRIDGE, MIDDX., ENGLAND
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, MECHANICAL ENGINEERING, COMPUTER-AIDED DESIGN
IDENTIFIERS: TURBOCHARGED DIESEL ENGINE, COMPRESSIBLE GAS FLOWS, EXHAUST PIPE, DISPLAY FACILITIES, BOUNDARY CONDITIONS, DESIGN FACILITIES, FINAL PROGRAM SUITE, CHANGES IN ENGINE, TURBOCHARGER PARAMETERS, FLOW EQUATIONS, MULTI PIPE EXHAUST SYSTEMS, CAD
SECTION CLASS CODES: C8847
UNIFIED CLASS CODES: WMEMAD

DEVELOPMENT OF A DESIGN SUITE FOR STUDYING THE UNSTEADY, COMPRESSIBLE GAS FLOWS IN THE EXHAUST PIPE OF A TURBOCHARGED DIESEL ENGINE IS DISCUSSED. INTERACTION AND DISPLAY FACILITIES WHICH COULD GREATLY ASSIST THE ENGINE DESIGNER ARE INCORPORATED. FOLLOWING A REVIEW OF THE METHOD OF SOLUTION EMPLOYED AND THE BOUNDARY CONDITIONS RELEVANT TO THIS APPLICATION, DETAILS OF THE INTERACTION AND DESIGN FACILITIES AND THE STRUCTURE OF THE FINAL PROGRAM SUITE ARE PRESENTED. EXAMPLES OF THE USE OF THE SUITE FOR STUDYING CHANGES IN ENGINE, EXHAUST PIPE AND TURBOCHARGER PARAMETERS ARE GIVEN FOR TWO ENGINES. AN EXTENSION TO THE DESIGN SUITE IS BRIEFLY DISCUSSED IN WHICH AN ALTERNATIVE METHOD OF SOLUTION OF THE FLOW EQUATIONS IS INCORPORATED AS AN ADDITIONAL MODULE. FINALLY, RECOMMENDATIONS ARE MADE FOR FURTHER EXTENDING THE DESIGN FACILITIES TO ACCOMMODATE COMPLEX MULTI PIPE EXHAUST SYSTEMS, AS THE USE OF COMPUTER-AIDED DESIGN TECHNIQUES WOULD SHOW EVEN GREATER BENEFIT TO THE ENGINE DESIGNER FOR SUCH SYSTEMS (8 REFS)

847579 A7600290, C7601842
MULTIELEMENT ANALYSIS VIA COMPUTER-CONTROLLED RAPID-SCAN ATOMIC FLUORESCENCE SPECTROMETER WITH A CONTINUUM SOURCE

JOHNSON, D.J., PLANKEY, F.W., WINEFORDNER, J.D. ; DEPT. OF CHEM., UNIV. OF FLORIDA, GAINESVILLE, FL, USA

ANAL. CHEM. (USA) VOL.47, NO.11 1739-43 SEPT. 1975 CODEN: ANCHAM

DESCRIPTORS: SPECTROCHEMICAL ANALYSIS, SPECTROMETER COMPONENTS AND ACCESSORIES, SPECTROCHEMICAL ANALYSIS, SPECTROSCOPY APPLICATIONS OF COMPUTERS

IDENTIFIERS: CONTINUUM SOURCE, TRACE WEAR METALS, JET ENGINE LUBRICATING OILS, AG, AU, CD, CR, CO, CU, FE, IN, MG, MN, NI, PB, PD, PT, SN, SR, TL, ZN, AL, BE, MO, TI, V, DETECTION LIMITS, COMPUTER CONTROLLED RAPID SCAN SLEWED SCAN ATOMIC FLUORESCENCE SPECTROMETER, MULTIELEMENT ANALYSIS, EIMAC XE ARC EXCITATION SOURCE, ACETYLENE FLAME , DETECTION LIMIT, ANALYTICAL CURVE, JET ENGINE LUBRICATING OIL, AIR FORCE AVERAGE TRACE METAL CONTENT VALUES

SECTION CLASS CODES: A0695, A0693, C8816

UNIFIED CLASS CODES: BGZMGP, BGZGAZ, WMCKAC

A VERSATILE, SIMPLE, RELATIVELY INEXPENSIVE COMPUTER-CONTROLLED, SLEWED-SCAN SPECTROMETER WITH A SINGLE EIMAC XENON ARC EXCITATION SOURCE, AND AN ACETYLENE (AIR OR N/SUB 2/O) FLAME IS DESCRIBED AND USED FOR MULTIELEMENT ANALYSIS OF TRACE WEAR METALS IN JET ENGINE LUBRICATING OILS. ANALYTICAL FIGURES OF MERIT OBTAINED FOR 18 ELEMENTS (AG, AU, CD, CR, CO, CU, FE, IN, MG, MN, NI, PB, PD, PT, SN, SR, TL, ZN) MEASURED WITH A SEPARATED AIR/ACETYLENE FLAME AND THE EIMAC SOURCE AND FOR 5 ELEMENTS (AL, BE, MO, TI, AND V) WITH A SEPARATED N/SUB 2/O/ACETYLENE FLAME AND THE SAME EIMAC SOURCE ARE LISTED. THE DETECTION LIMITS OBTAINED ARE COMPARABLE TO THE BEST VALUES OBTAINED BY FLAME ATOMIC ABSORPTION SPECTROMETRY WITH SINGLE ELEMENT HOLLOW CATHODE LAMPS (7 REFS)

846519 C7600747
SENSING AND INPUT SYSTEM FOR COMPUTER CONTROL OF IC ENGINE
PATENT NO.: UK 1400614 ASSIGNEES: RENAULT AND PEUGEOT FILED: 13 JUNE 1972
ORIGINAL PATENT APPL. NO.: FRANCE 71.21514
PRIORITY DATE: 14 JUN 1971
16 JULY 1975
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, ANGULAR VELOCITY MEASUREMENT, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, ELECTRIC SENSING DEVICES, SIGNAL PROCESSING
IDENTIFIERS: COMPUTER CONTROL, INTERNAL COMBUSTION ENGINE, TOOTHED RING, FLYWHEEL, PULSE TRAIN, ENGINE SPEED, SENSORS, ANGULAR POSITION, CRANKSHAFT, SIGNAL PROCESSING CIRCUITRY
SECTION CLASS CODES: C7851, C8846, C7441, C7442
UNIFIED CLASS CODES: VMKCAD, WMEKAS, BKECAB, BKEEAM
THE SYSTEM IS OPERATIVE WITH AN INTERNAL COMBUSTION ENGINE HAVING A TOOTHED RING MOUNTED ON THE FLYWHEEL FOR ENGAGEMENT BY THE PINION OF A STARTER MOTOR. A FIRST SENSOR IS RESPONSIVE TO THE PASSAGE OF THE TEETH TO PRODUCE A FIRST PULSE TRAIN, HAVING A FREQUENCY RELATED TO THE ENGINE SPEED. SECOND AND THIRD SENSORS ARE RESPONSIVE TO COACTING ELEMENTS MOUNTED ON THE FLYWHEEL. THESE ELEMENTS ARE DISPOSED IN PRE-DETERMINED ANGULAR RELATIONSHIPS WITH THE ENGINE CRANKS ETC. AND PRODUCE SIGNALS REPRESENTING THE ANGULAR POSITION OF THE CRANKSHAFT ETC. AT GIVEN INSTANTS, THE SIGNALS FROM EACH OF THE SENSORS BEING FED INTO SIGNAL PROCESSING CIRCUITRY

835469 B7543875, C7528449
APPARATUS FOR DETERMINING THE GROSS THRUST OF A JET ENGINE
PLETT, E.G.
PATENT NO.: USA 3886790 ASSIGNEES: CONTROL DATA CANADA LTD FILED: 18 MARCH 1974
ORIGINAL PATENT APPL. NO.: CANADA 169738
PRIORITY DATE: 27 APR 1973
3 JUNE 1975
DESCRIPTORS: AEROSPACE ENGINES, GAS TURBINES, PRESSURE MEASUREMENT, AEROSPACE APPLICATIONS OF COMPUTERS
IDENTIFIERS: GROSS THRUST, JET ENGINE, NOZZLE TOTAL PRESSURE, DIFFUSER, STATIC PRESSURES, NOZZLE ENTRANCE, COMPUTER
SECTION CLASS CODES: C8849, C7851, B4720
UNIFIED CLASS CODES: WMEZAN, VMKCAD, ZLEAAZ
THE APPARATUS COMPUTES THE NOZZLE TOTAL PRESSURE FROM MEASUREMENTS OF THE TOTAL PRESSURE IN THE DIFFUSER AND OF THE STATIC PRESSURES AT THE NOZZLE ENTRANCE AND ON THE UPSTREAM SIDE OF THE DIFFUSER

835458   B7540413, C7528438
COMPUTERIZED DIAGNOSTIC TESTER AT HAND
O:HARA, J.F., ASHTON, D.H., KRAMER, L.L. ; DETROIT EDISON CO., DETROIT, MI, USA
ELECTR. WORLD (USA) VOL.184, NO.3 36-50 1 AUG. 1975 CODEN: ELWOA3
DESCRIPTORS: AUTOMOBILES, MAINTENANCE ENGINEERING, COMPUTER-AIDED ANALYSIS, AUTOMATIC TEST EQUIPMENT
IDENTIFIERS: ENGINE, AUTOMOBILES, TRUCKS, MAINTENANCE, COMPUTERISED DIAGNOSTIC TESTER
SECTION CLASS CODES: B1263, B5620, C8849
UNIFIED CLASS CODES: ADGDAL, TKEAAR, WMEZAN
A NEW, COMPUTER-RUN ENGINE DIAGNOSTIC SYSTEM THAT TELLS WHAT TO FIX, AND HAS THE POTENTIAL TO ELIMINATE COSTLY, TIME-CONSUMING TRIAL-AND-ERROR REPAIRS OF AUTOMOBILES AND TRUCKS, IS CURRENTLY BEING EVALUATED BY CONSOLIDATED EDISON CO. IN A CONCERTED EFFORT TO MINIMIZE FLEET-MAINTENANCE COSTS WHILE OPTIMIZING FUEL USAGE. THE TESTER, DEVELOPED BY HAMILTON TEST SYSTEMS (HTS), A SUBSIDIARY OF UNITED TECHNOLOGIES CORP, AUTOMATICALLY CHECKS ELECTRICAL, EXHAUST EMISSION, AND OTHER ENGINE CONDITIONS, DETERMINES WHAT IS WRONG, AND DECIDES WHAT PARTS HAVE TO BE REPAIRED, ADJUSTED, OR REPLACED. ITS COMPUTER THEN ISSUES A PRINTOUT, WHICH PROVIDES ALL THIS INFORMATION BOTH TO THE MECHANIC AND TO FLEET MANAGEMENT

833711   C7526451
MODELLING ENGINE STATIC STRUCTURES WITH CONICAL SHELL FINITE ELEMENTS
KIELB, R.E. ; AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AIR FORCE BASE, OH, USA
J. AIRCR. (USA) VOL.12, NO.4 230-3 APRIL 1975 CODEN: JAIRAM
DESCRIPTORS: FINITE ELEMENT ANALYSIS, AEROSPACE ENGINES, MODELLING, AEROSPACE APPLICATIONS OF COMPUTERS
IDENTIFIERS: ENGINE STATIC STRUCTURES, CONICAL SHELL FINITE ELEMENTS , NONSYMMETRIC LOADING, COMPUTER TIME, AZMUTHAL COORDINATE, STRESS, NONSYMMETRIC DISPLACEMENT, FOURIER SERIES, STANDARD PLATE MODEL, STANDARD BEAM MODEL, MODELLING
SECTION CLASS CODES: C6420, C8849, C8200
UNIFIED CLASS CODES: VCEAAX, WMEZAN, DLTAAE
THE CONICAL SHELL ELEMENT WITH NONSYMMETRIC LOADING AND DISPLACEMENT CAPABILITIES HAS EXCELLENT POSSIBILITIES FOR APPLICATION TO ENGINE STATIC STRUCTURES. THE MAJOR BENEFIT WOULD BE A DRAMATIC REDUCTION IN COMPUTER TIME AS COMPARED WITH A PLATE MODEL, HOWEVER, A SEVERE LIMITATION IS THE INABILITY TO COMBINE THIS ELEMENT WITH ANY OTHER ELEMENT TYPES. A TECHNIQUE IS SHOWN THAT CAN BE USED TO BYPASS THIS ELEMENT COMPATIBILITY PROBLEM. THE INHERENT DIFFICULTY LIES IN THE DEGREE-OF-FREEDOM PECULIARITIES OF THE CONICAL SHELL ELEMENT. THE NONSYMMETRIC MOTION OF THIS ELEMENT IS ACCOMPLISHED BY EXPANDING EACH DEGREE OF FREEDOM IN A FOURIER SERIES WITH RESPECT TO THE AZMUTHAL COORDINATE. THE TECHNIQUE PRESENTED SUMS THIS FOURIER SERIES FOR EACH DEGREE OF FREEDOM AND CONNECTS IT TO THE APPROPRIATE DEGREE OF FREEDOM FOR THE NONSHELL PORTIONS OF THE STRUCTURE BY USING FUNCTIONAL CONSTRAINTS. THE METHODS USED TO MAKE THE ELEMENTS COMPATIBLE AND THE COMPUTER TIME, DISPLACEMENT, AND STRESS COMPARISONS WITH STANDARD PLATE AND BEAM MODELS WILL BE SHOWN (3 REFS)

821950 C75025494
NUMERICALLY-EXPERIMENTAL STUDY ON THE COMBUSTION AND PERFORMANCE OF A SPARK-IGNITION ENGINE. 4 CYCLE ENGINE
HATTA, K., SANO, T. ; INST. OF SPACE AND AERONAUTICAL SCI., UNIV. TOKYO, TOKYO, JAPAN
BULL. INST. SPACE AND AERONAUT. SCI. UNIV. TOKYO A (JAPAN) VOL.10, NO.4A 715-54 OCT. 1974 CODEN: TDUHAD
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, AIR POLLUTION, SIMULATION, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SPARK IGNITION ENGINE, ATMOSPHERIC POLLUTANT NO, COMBUSTION PROCESS, FLAME PROPAGATION, SIMULATION MODEL, N-OCTANE, NUMERICAL EXPERIMENTAL STUDY, FOUR CYCLE ENGINE, DIGITAL COMPUTER ANALYSIS
SECTION CLASS CODES: C8847
UNIFIED CLASS CODES: WMEMAD
LANGUAGE: JAPANESE
DIGITAL COMPUTER ANALYSIS OF THE PERFORMANCE OF A SPARK IGNITION ENGINE AND THE SUBSEQUENT FORMATION OF THE ATMOSPHERIC POLLUTANT NO PRESENTS A BETTER UNDERSTANDING OF THE COMBUSTION PROCESS BASED ON THE ONE-DIMENSIONAL THEORY OF FLAME PROPAGATION UNDER THE HEAT EXCHANGING BETWEEN WALLS AND GAS IN THE CYLINDER. BECAUSE OF MAJOR INTEREST IN THE COMBUSTION PROCESS FOR THE PRESENTATION OF A NUMERICAL SIMULATION MODEL, THE GAS EXCHANGE PROCESS IS SIMPLY ASSUMED TO BE OF THE IDEALIZED INDICATOR DIAGRAM. AS THE FUEL, N-OCTANE AND AS THE COMPONENTS OF THE BURNED GAS, ELEVEN SPECIES, CO, CO/SUB 2/, H, H/SUB 2/, H/SUB 2/O, N, N/SUB 2/, NO, O, O/SUB 2/ AND OH ARE CONSIDERED TO BE IN CHEMICAL EQUILIBRIUM EXCEPT FOR NO WHOSE FORMATION IS PREDICTED BY ZELDOVICH MECHANISM (4 REFS)

820772 C75024130
CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINE
PATENT NO.: UK 1395027 ASSIGNEES: CHANTIERS ATLANTIQUES FILED: 12 APRIL 1972
ORIGINAL PATENT APPL. NO.: FRANCE 13341
PRIORITY DATE: 15 APR 1971
21 MAY 1975
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: INTERNAL COMBUSTION ENGINE, CONTROL MEMBERS, CRANKSHAFT , COMPUTER, CONTROL INSTRUCTION, REFERENCE POSITION, ENGINE SPEED, VALVES, FUEL INJECTION PUMPS, ENGINE LOAD, ENGINE TEMPERATURE
SECTION CLASS CODES: C7851, C8846
UNIFIED CLASS CODES: VMKCAD, WMEKAS
THE SYSTEM ACTS ON THE MOTIONS OF CONTROL MEMBERS WHOSE DISPLACEMENTS ARE A FUNCTION OF ROTATION OF THE ENGINE CRANKSHAFT. THE CONTROL IS EFFECTED THROUGH A COMPUTER, WITH SIGNALS REPRESENTING CONTROL INSTRUCTION AND THE ANGULAR POSITION OF THE CRANKSHAFT RELATIVE TO A REFERENCE POSITION, AND PREVAILING CONDITIONS IN THE ENGINE. THESE CONDITIONS INCLUDE ENGINE SPEED, LOAD AND ENGINE TEMPERATURE; THE CONTROL SIGNALS FROM THE COMPUTER ACT ON THE INLET AND EXHAUST VALVES AND FUEL INJECTION PUMPS

810343 B75035772, C7522632
GAS EXCHANGE CALCULATIONS: TURBINE AND ENGINE VALVE BOUNDARY CONDITIONS. APPLICATIONS AND CORRELATIONS WITH ENGINE TEST DATA
BULATY, T. ; BBC AKTIENGESELLSCHAFT BROWN, BOVERI CIE, BADEN, SWITZERLAND
INT. J. MECH. SCI. (GB) VOL.17, NO.5 325-37 MAY 1975 CODEN: IMSCAW
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, BOUNDARY-VALUE PROBLEMS, GAS TURBINES, VALVES
IDENTIFIERS: GAS EXCHANGE CALCULATIONS, ENGINE VALVE, BOUNDARY CONDITIONS, ENGINE TEST DATA, COMPUTER PROGRAMS, THERMODYNAMIC MODEL, TURBOCHARGER TURBINE, MATHEMATICAL REPRESENTATION, TIMING
SECTION CLASS CODES: C8847, B5244, C7851
UNIFIED CLASS CODES: WMEMAD, TEGEAT, VMKCAD
WHEN INVESTIGATING THE COMBINED OPERATION OF INTERNAL COMBUSTION ENGINES AND TURBOCHARGERS, COMPUTER PROGRAMS ARE USED TO CALCULATE THE GAS EXCHANGE PROCESS, FOR WHICH ASSUMPTIONS OF VARYING COMPLEXITY ARE MADE. APART FROM A THERMODYNAMIC MODEL FOR THE CYLINDERS AND PIPING, SUCH PROGRAMS REQUIRE BOUNDARY CONDITIONS FOR THE SYSTEM OF EXHAUST PIPING, I.E. APPROPRIATE DESCRIPTIONS OF THE TURBOCHARGER TURBINE AND THE ENGINE VALVE SYSTEM. THE MATHEMATICAL REPRESENTATION OF THE CHARACTERISTICS OF THE TURBOCHARGER TURBINES AND THE ENGINE VALVES ARE COVERED. GENERAL RULES ARE DERIVED FOR THE CHOICE OF SUITABLE TIMING FOR TURBOCHARGED FOUR-STROKE ENGINES, BASED ON THE COMPUTED OPTIMIZATION OF THE VALVE TIMING, AND BY CORRELATING EXPERIMENTAL RESULTS AND THE CHARACTERISTIC VALUES OF THE VALVES (12 REFS)

785175 C7516497
DIGITAL INTEGRATED CONTROL OF A MACH 2.5 MIXED-COMPRESSION SUPERSONIC INLET AND AN AUGMENTED MIXED-FLOW TURBOFAN ENGINE
BATTERTON, P.G., ARPASI, D.J., BAUMBICK, R.J.
REPORT NO.: NASA-TM-X-3075 ISSUED BY: NASA, CLEVELAND, OHIO, USA
OCT. 1974
DESCRIPTORS: AEROSPACE ENGINES, DIGITAL CONTROL, AEROSPACE CONTROL
IDENTIFIERS: MACH 2.5, MIXED COMPRESSION SUPERSONIC INLET, MIXED FLOW TURBOFAN ENGINE, DIGITAL CONTROL, AEROSPACE ENGINES, DIGITAL INTEGRATED CONTROL
SECTION CLASS CODES: C7875
UNIFIED CLASS CODES: VMRMAY
AVAILIABILITY: NTIS SPRINGFIELD, VA. 22151, USA
A DIGITALLY IMPLEMENTED INTEGRATED INLET-ENGINE CONTROL SYSTEM WAS DESIGNED AND TESTED ON A MIXED-COMPRESSION, AXISYMMETRIC, MACH 2.5 SUPERSONIC INLET WITH 45 PERCENT INTERNAL SUPERSONIC AREA CONTRACTION AND A TF30-P-3 AUGMENTED TURBOFAN ENGINE. THE CONTROL MATCHED ENGINE AIRFLOW TO AVAILABLE INLET AIRFLOW. BY MONITORING INLET TERMINAL SHOCK POSITION AND OVER-BOARD BYPASS DOOR COMMAND, THE CONTROL ADJUSTED ENGINE SPEED SO THAT IN STEADY STATE, THE SHOCK WOULD BE AT THE DESIRED LOCATION AND THE OVERBOARD BYPASS DOORS WOULD BE CLOSED. DURING ENGINE-INDUCED TRANSIENTS, SUCH AS AUGMENTOR LIGHT-OFF AND CUTOFF, THE INLET OPERATING POINT WAS MOMENTARILY CHANGED TO A MORE SUPERCRITICAL POINT TO MINIMIZE UNSTARTS. THE DIGITAL CONTROL ALSO PROVIDED AUTOMATIC INLET RESTART. A VARIABLE INLET THROAT BLEED CONTROL BASED ON THROAT MACH NUMBER, PROVIDED ADDITIONAL INLET STABILITY MARGIN

784536 C75015757
THE DEVELOPMENT OF A COMPUTER MODEL FOR PREDICTION OF THE US TRUCK AND BUS POPULATION, FUEL USAGE, AND AIR POLLUTION CONTRIBUTION
TINGLEY, D.S., JOHNSON, J.H. ; MICHIGAN TECHNOL. UNIV., USA
VOGT, W.G., MICKLE, M.H.
MODELLING AND SIMULATION, VOL.4 53-8 1973
23-24 APRIL 1973 PITTSBURGH, PA., USA
PUBL: ISA PITTSBURGH, PA., USA
DESCRIPTORS: TRANSPORTATION, ROAD VEHICLES, AIR POLLUTION, SIMULATION
IDENTIFIERS: TRANSPORTATION, SIMULATION, COMPUTER MODEL, TRUCK, BUS POPULATION, FUEL USAGE, AIR POLLUTION CONTRIBUTION, VEHICLE PRODUCTION PROJECTIONS, ENGINE, VEHICLE WEIGHT, 1932 TO THE YEAR 2000, DIESEL, GASOLINE
SECTION CLASS CODES: C6420, C7871
UNIFIED CLASS CODES: VCEAAX, VHRCAZ
USING NEW VEHICLE PRODUCTION PROJECTIONS, THE MODEL COMPUTES TRUCKS IN THE POPULATION BY TYPE OF ENGINE (GASOLINE OR DIESEL), GROSS VEHICLE WEIGHT AND BY AGE. FROM THESE DATA IT CALCULATES THE RESPECTIVE CO, HC, NO/SUB X/, CO/SUB 2/ AND PARTICULATE MATTER EMISSIONS AND THE FUEL USAGE BY VARIOUS VEHICLES. THE MODEL COVERS THE TIME PERIOD FROM 1932 TO THE YEAR 2000. VARIOUS PUBLISHED POPULATION, FUEL USAGE, SCRAPPAGE, AND SALES DATA ARE USED TO VERIFY THE ACCURACY OF THE MODEL. THE MODEL IS DEVELOPED TO THE POINT OF ITS VARIFICATION. CONCLUSIONS ABOUT THE AIR POLLUTION AND FUEL USAGE OF DIESEL AND GASOLINE POWERED TRUCKS ARE DRAWN FROM THE MODEL RESULTS (10 REFS)

772877 C75014820
THE INFLUENCE OF AVIONIC SYSTEM REQUIREMENT ON AIRBORNE COMPUTER DESIGN
SHEPHERD, J.T. ; MARCONI-ELLIOTT AVIONIC SYSTEMS LTD., ROCHESTER, ENGLAND
; AGARD
AGARD CONFERENCE PROCEEDINGS NO.149 ON REAL TIME COMPUTER BASED SYSTEMS 28/1-21 1974
27-31 MAY 1974 AGARD ATHENS, GREECE
PUBL: AGARD NEUILLY SUR SEINE, FRANCE
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, SPECIAL PURPOSE COMPUTERS
IDENTIFIERS: AUTOPILOTS SYSTEMS, AVIONIC SYSTEM REQUIREMENT, AIRBORNE COMPUTER DESIGN, CONSTRAINTS, SYSTEM PERFORMANCE REQUIREMENTS, AIRCRAFT OPERATIONAL ECONOMIC ENVIRONMENT, AIR DATA SYSTEMS, FLIGHT DIRECTOR SYSTEMS, HEAD UP, WEAPON DELIVERY SYSTEMS, NAVIGATION SYSTEMS, CENTRAL MANAGEMENT SYSTEMS, ENGINE CONTROL SYSTEMS
SECTION CLASS CODES: C8849, C9840
UNIFIED CLASS CODES: WHEZAN, XREAAP
THIS PAPER EXAMINES THE CONSTRAINTS IMPOSED UPON THE AIRBORNE COMPUTER DESIGNER BY THE SYSTEM PERFORMANCE REQUIREMENTS AND THE AIRCRAFT OPERATIONAL ECONOMIC ENVIRONMENT. IN ORDER TO EXAMINE THESE REQUIREMENTS A NUMBER OF TYPICAL SYSTEMS ARE CONSIDERED

771969 B7522914, C7513821
THYRISTOR DRIVE SYSTEM FOR A TESTING STAND OF AIRCRAFT ENGINE FUEL SYSTEMS
LASTOWIECKI, J., DUSZCZYK, K. ; POLITECHNIKA WARSZAWSKA, POLAND
PRZEGL. ELEKTROTECH. (POLAND) VOL.51, NO.1 11-13 JAN. 1975
CODEN: PZELAL
DESCRIPTORS: THYRISTOR APPLICATIONS, ELECTRIC DRIVES, AUTOMATIC TEST EQUIPMENT, AIRCRAFT, AEROSPACE CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: OPTIMAL CONTROLLER SETTING, DIRECT CURRENT DRIVE SYSTEM , AEROSPACE CONTROL, AUTOMATIC TEST EQUIPMENT, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, THYRISTOR DRIVE SYSTEM, TESTING STAND, AIRCRAFT ENGINE FUEL SYSTEMS, ELECTRONIC REGULATORS, COMPUTER CONTROLLED 30 KW MOTOR
SECTION CLASS CODES: C7875, C8846, C7856, B5620
UNIFIED CLASS CODES: VMRMAY, WMEKAS, VMKKAR, TKEAAR
LANGUAGE: POLISH
A METHOD OF DESIGNING A DRIVING SYSTEM FOR A TESTING STAND OF AIRCRAFT ENGINE FUEL SYSTEMS IS DISCUSSED. THE RELATIONSHIPS FOR AN OPTIMUM CHOICE OF THE SETTINGS OF ELECTRONIC REGULATORS ARE GIVEN. THE RESULTS OF TESTS ON A D.C. DRIVE SYSTEM WITH A COMPUTER CONTROLLED 30 KW MOTOR IS DISCUSSED (3 REFS)

771954 B7522915, C7513806
COMPUTERS ON MERCHANT SHIPS. II
POLET, T.W., POLET, T.W., JR.
POLYTECH. TIJDSCHR. ELEKTROTECH. ELEKTRON. (NETHERLANDS) VOL.30, NO.5 149-55 5 MARCH 1975 CODEN: PTEEBR
DESCRIPTORS: SHIPS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, RADIONAVIGATION, COMMUNICATIONS APPLICATIONS OF COMPUTERS, PROCESS COMPUTERS
IDENTIFIERS: ONLINE OPERATION, OFF LINE OPERATION, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, RADIONAVIGATION, COMMUNICATIONS APPLICATIONS OF COMPUTERS, MERCHANT SHIPS, PROCESS CONTROL COMPUTERS, ENGINE CONTROL AND MAINTENANCE, SHIPBOARD TRIALS, COLLISION PREVENTION COMPUTER SIDED SYSTEMS, INTEGRATED NAVIGATION SYSTEMS, SOURCES OF ERRORS
SECTION CLASS CODES: B5620, C7874, C8846, C8842, B3660, C7850
UNIFIED CLASS CODES: TKEAAR, VMRKAM, WMEKAS, WMEEAO, FGKAAZ, VMKAAS
LANGUAGE: DUTCH
FOR PT.I SEE IBID., VOL.30, NO.4, P.103 (1975). THE FUNCTION OF ON-LINE AND OFF-LINE PROCESS CONTROL COMPUTERS IS ILLUSTRATED BY BLOCK DIAGRAMS. IT IS SUGGESTED THAT THE APPLICATION OF COMPUTERS TO ENGINE CONTROL AND MAINTENANCE IS EASIER THAN THEIR APPLICATION TO NAVIGATION PROBLEMS. SOME SHIPBOARD TRIALS HAVE SHOWN UP POSSIBLE SOURCES OF ERRORS. AS THE MOST USEFUL NAVIGATION AIDS, THE COLLISION PREVENTION COMPUTER AIDED SYSTEMS ARE CONSIDERED. THE USE OF INTEGRATED NAVIGATION SYSTEMS IS INCREASING

758985 C7512019
COMPUTER PROGRAM TO PREDICT THE GAS EXCHANGE PROCESS OF A DIESEL ENGINE
HALLAM, A.J., COTTAM, S. ; RUSTON PAXMAN DIESELS LTD., LINCOLN, ENGLAND
COMPUT. AIDED DES. (GB) VOL.7, NO.2 83-8 APRIL 1975 CODEN: CAIDA5
DESCRIPTORS: COMPUTER-AIDED DESIGN, INTERNAL COMBUSTION ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, THERMODYNAMICS
IDENTIFIERS: INTERNAL COMBUSTION ENGINES, COMPUTER AIDED DESIGN, COMPUTER PROGRAM, PREDICT, GAS EXCHANGE PROCESS, DIESEL ENGINE, THERMODYNAMIC PERFORMANCE, DATA PREPARATION
SECTION CLASS CODES: C8847
UNIFIED CLASS CODES: WMEMAD
RUSTON PAXMAN DIESELS LTD HAS MADE MUCH USE OF COMPUTER PROGRAMS IN THE DEVELOPMENT OF DIESEL ENGINES, IN PARTICULAR FOR THE PREDICTION OF THERMODYNAMIC PERFORMANCE. THE ORIGINAL PROGRAM FOR THIS PURPOSE HAS UNDERGONE CONSIDERABLE CHANGE, BOTH TO IMPROVE THE ACCURACY AND EXTEND THE APPLICATION. THESE CHANGES HAVE RESULTED IN THE PROGRAM BECOMING UNNECESSARILY COMPLICATED FOR THE DESIGNER TO USE. BY RETURNING TO FIRST PRINCIPLES A NEW PROGRAM HAS BEEN WRITTEN THAT IS CONSIDERABLY MORE VERSATILE THAN THE OLD ONE, AND WHICH IS FAR SIMPLER TO USE BECAUSE DATA PREPARATION IS NOW GOVERNED SOLELY BY THE COMPLEXITY OF THE PROBLEM BEING TACKLED. THIS PROGRAM IS DESCRIBED (7 REFS)

745056 E7513864
HOW UNCONVENTIONAL STIRLING ENGINES CAN HELP CONSERVE ENERGY
MARTINI, W.R., WHITE, M.A., DESTEESE, J.G. ; MCDONNELL DOUGLAS CORP., RICHLAND, WASH., USA
; ASME, IEEE, ET AL
9TH INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE PROCEEDINGS 1092-9 1974
26-30 AUG. 1974 ASME, IEEE, ET AL SAN FRANCISCO, CALIF., USA
PUBL: ASME NEW YORK, USA
DESCRIPTORS: HEAT ENGINES
IDENTIFIERS: SINGLE VALVE CONTROL, DOUBLE STIRLING ENGINE CHILLER, STIRLING ENGINES, FREE POWER PISTON, FREE DISPLACER, DRIED ORGANIC MATTER, COMPUTER SIMULATIONS, ENGINE TESTS, SELF STARTING, DIRECT HYDRAULIC POWER, VEHICLES, MECHANICAL POWER CONCEPT, THERMALLY REGENERATIVE BRAKING, DESIGN CONCEPT, FLAT PLATE SOLAR COLLECTOR, BUILDINGS
SECTION CLASS CODES: B5240
UNIFIED CLASS CODES: TEGAAX
UNCONVENTIONAL STIRLING ENGINES, WITH EITHER A FREE POWER PISTON OR FREE DISPLACER, CAN EFFICIENTLY USE A WIDE VARIETY OF FUELS, INCLUDING DRIED ORGANIC MATTER, A MAJOR UNUSED FUEL RESOURCE. BOTH COMPUTER SIMULATIONS AND ENGINE TESTS HAVE DEMONSTRATED SELF STARTING AND SINGLE-VALVE CONTROL OF AN ENGINE PRODUCING HYDRAULIC POWER FROM HEAT WITHOUT INTERVENING SHAFT POWER. DIRECT HYDRAULIC POWER FOR VEHICLES IS EVALUATED AS IS A MECHANICAL POWER CONCEPT PART PARTICULARLY ATTRACTIVE BECAUSE OF THERMALLY REGENERATIVE BRAKING. FINALLY, A DESIGN CONCEPT WHICH CAN USE 200 DEGREESF HEAT FROM A FLAT PLATE SOLAR COLLECTOR OR HIGHER TEMPERATURE COMBUSTION HEAT SOURCES TO MORE EFFICIENTLY PRODUCE HEATING AND COOLING FOR BUILDINGS THAN IS NOW POSSIBLE (4 REFS)

735401 C7506296
APPLICATION OF FUZZY ALGORITHMS FOR CONTROL OF SIMPLE DYNAMIC PLANT
MAMDANI, E.H. ; QUEEN MARY COLL., LONDON, ENGLAND
PROC. INST. ELECTR. ENG. (GB) VOL. 121 NO. 12 1585-8 DEC. 1974
CODEN: PIEEAH
DESCRIPTORS: HEAT ENGINES, CONTROL SYSTEMS, DIRECT DIGITAL CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: LABORATORY BUILT STEAM ENGINE, APPLICATION OF FUZZY ALGORITHMS, CONTROL OF SIMPLE DYNAMIC PLANT, CONTROLLER
SECTION CLASS CODES: C7851, C8846
UNIFIED CLASS CODES: VMKCAD, WMEKAS
THE PAPER DESCRIBES A SCHEME IN WHICH A FUZZY ALGORITHM IS USED TO CONTROL PLANT, IN THIS CASE, A LABORATORY-BUILT STEAM ENGINE. THE ALGORITHM IS IMPLEMENTED AS AN INTERPRETER OF A SET OF RULES EXPRESSED AS FUZZY CONDITIONAL STATEMENTS. THIS IMPLEMENTATION ON A DIGITAL COMPUTER IS USED ON-LINE, TO CONTROL THE PLANT. THE MERIT OF SUCH A CONTROLLER IS DISCUSSED IN THE LIGHT OF THE RESULTS OBTAINED

732554 B7508079
DIGITAL DWELL ANGLE ENCODER
SHAKIB, J. ; IBM, NEW YORK, USA
IBM TECH. DISCLOSURE BULL. (USA) VOL.27, NO.5 1280-1 OCT. 1974
CODEN: IBMTAA
DESCRIPTORS: COUNTING CIRCUITS, ELECTRIC IGNITION
IDENTIFIERS: DIGITAL DWELL ANGLE ENCODER, DWELL ANGLE, IGNITION SYSTEM, LOGICALLY GATING CLOCK PULSES, COUNTING CIRCUITS, AUTOMATED DATA ACQUISITION, DIAGNOSTICS OF AUTOMOBILE ENGINE PERFORMANCE
SECTION CLASS CODES: B1830, B5620, B1870
UNIFIED CLASS CODES: ETGAAT, TKEAAR, ETWAAP
THE DWELL ANGLE OF THE POINTS OF AN IGNITION SYSTEM FOR AN INTERNAL COMBUSTION ENGINE IS DIGITIZED BY LOGICALLY GATING CLOCK PULSES INTO COUNTING CIRCUITS. THE APPARATUS IS PARTICULARLY USEFUL FOR PROVIDING A DIRECT READOUT DIGITAL RESULT OR INPUT DATA TO A COMPUTER, AND IS PARTICULARLY WELL SUITED FOR AUTOMATED DATA ACQUISITION AND DIAGNOSTICS OF AUTOMOBILE ENGINE PERFORMANCE

727295 C7505344
A SIMILARITY PARAMETER FOR SCALING DYNAMIC INLET DISTORTION
MOORE, M.T. ; GENERAL ELECTRIC CO., CINCINNATI, OHIO, USA
TRANS. ASME SER. B (USA) VOL. 96, NO. 3 795-800 AUG. 1974
CODEN: JEPIA8
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE ENGINES
IDENTIFIERS: METHOD D PARAMETER, SIMILARITY PARAMETER, DYNAMIC INLET DISTORTION, ANALOGUE AND DIGITAL ANALYSES, METHOD D DISTORTION METHODOLOGY, ANALOGUE FILTERING, DIGITAL AVERAGING, TURBINE ENGINE PERFORMANCE
SECTION CLASS CODES: C8849
UNIFIED CLASS CODES: WMEZAN
DESCRIBES THE ANALOGUE FILTER BANDWIDTH AND DIGITAL AVERAGE TIME OF THE TIME-DEPENDENT PRESSURE DATA PRIOR TO COMPUTATION OF THE METHOD D PARAMETERS. ANALOGUE FILTERING AND DIGITAL AVERAGING ARE SHOWN TO BE EQUIVALENT UNDER CERTAIN CONDITIONS AND CONSISTENT SELECTION CAN BE MADE FOR COMPARISON OF TRENDS IN INLET DYNAMIC DISTORTION BETWEEN INLETS OF DIFFERENT TYPES AND SIZES

727276 C7505324
PROSPECTS FOR ADVANCED COMPUTER ROLES IN MARINE ENGINE MONITORING
WILLIAMS, V.E.
SPERRY TECHNOL. (USA) VOL. 2 NO. 2 34-5 1974 CODEN: SPTYBV
DESCRIPTORS: MARINE SYSTEMS, NAVAL ENGINEERING, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: ALARM SCANNING TECHNIQUE, DIGITAL COMPUTER, DATA PROCESSING, MARINE ENGINE MONITORING, AUTOMATED SYSTEM, WARNING SYSTEM, PREDICTIVE MAINTENANCE SYSTEM, PROGRAMMING MATHEMATICAL MODELS, SAFETY CONTROL SYSTEMS
SECTION CLASS CODES: C8847, C8846, C8849
UNIFIED CLASS CODES: WMEMAD, WMEKAS, WMEZAN
REVIEWS THE APPLICATIONS OF COMPUTERS IN MARINE ENGINE MONITORING WHICH INCLUDE AUTOMATED SYSTEM, WARNING SYSTEM, PREDICTIVE MAINTENANCE SYSTEM, PROGRAMMING MATHEMATICAL MODELS, AND SAFETY CONTROL SYSTEMS

726729 B7504833, C7504672
ADJUSTABLE COUNTER FOR THE CONTROL OF A DIESEL ENGINE TEST PROGRAMME
GRYGAS, U., HOTTOWITZ, R. ; TECH. HOCHSCHULE OTTO VON GUERICKE MAGDEBURG, GERMANY
WISS. Z. TECH. HOCHSCH. OTTO VON GUERICKE MAGDEB. (GERMANY) VOL. 18 NO. 3 311-15 1974 CODEN: WCGMAI
DESCRIPTORS: COUNTERS, COUNTER ACCESSORIES, ELECTRIC CONTROL EQUIPMENT, INTERNAL COMBUSTION ENGINES, AUTOMATIC TEST EQUIPMENT, MACHINE TESTING
IDENTIFIERS: ADJUSTABLE COUNTER, ANALOGUE TO DIGITAL CONVERTOR, CONTROL, DIESEL ENGINE, TEST PROGRAMME, TEST BED, TECHNICAL UNIVERSITY OF MAGDEBURG, FUEL INJECTION, CAMERA FILM TRANSPORT, OSCILLOSCOPE CAMERA, COMBUSTION PRESSURE, PHOTOELECTRIC PULSES, CRANKSHAFT, CAMSHAFT, LOGIC SYSTEM, MIXTURE FORMATION, COMBUSTION PROCESSES
SECTION CLASS CODES: C7896, C7682, B1269
UNIFIED CLASS CODES: VMZRAY, VKMCAV, ADGMAE
LANGUAGE: GERMAN
DESCRIBES A TEST BED AT THE TECHNICAL UNIVERSITY OF MAGDEBURG TO STUDY THE MIXTURE FORMATION AND COMBUSTION PROCESSES ON A ONE-CYLINDER DIESEL ENGINE. AN ADJUSTABLE COUNTER UNIT CONTROLS THE SWITCHING INSTANTS OF FUEL INJECTION, CAMERA FILM TRANSPORT, OSCILLOSCOPE CAMERA AND ANALOGUE-TO-DIGITAL CONVERTER OF COMBUSTION PRESSURE. THE COUNTER IS GOVERNED BY PHOTO ELECTRIC PULSES FROM THE CRANKSHAFT, CAMSHAFT AND DEAD CENTRE POSITION. THE COUNTER ACTIVATES THE MEASURING INSTRUMENTS DURING A PRESCRIBED WORK PERIOD OF THE ENGINE, ENABLING DIRECT COMPARISON OF DIFFERENT MEASURED QUANTITIES. THE ORGANIZATION OF THE MEASUREMENT PROGRAMME IS DISCUSSED AND THE LOGIC SYSTEM AND CONSTRUCTION OF THE COUNTER ARE DESCRIBED

722527   B7506913, C7503292
SMALL TRANSFORMER DESIGN BY COMPUTER
PALMER, M.D.
REPORT NO.: RAE-TR-73155   ISSUED BY: ROYAL AIRCRAFT ESTABL., FARNBOROUGH, ENGLAND
FEB. 1974
DESCRIPTORS: POWER TRANSFORMERS, ELECTRICAL ENGINEERING APPLICATIONS OF COMPUTERS, ION ENGINES, AEROSPACE APPLICATIONS OF COMPUTERS, COMPUTER-AIDED DESIGN
IDENTIFIERS: POWER TRANSFORMER DESIGN, COMPUTER AIDED DESIGN, AEROSPACE PROPULSION, ION ENGINE SUPPLY, AEROSPACE APPLICATIONS OF COMPUTERS, IMPROVEMENTS IN EFFICIENCY, REDUCTION IN MASS
SECTION CLASS CODES: B4760, B5350, C8849, C8841
UNIFIED CLASS CODES: ZLKAAM, TGKAAT, WMEZAN, WMECAF
AVAILIABILITY: NTIS, SPRINGFIELD, VA. 22151, USA
A COMPUTER PROGRAM WAS WRITTEN TO INVESTIGATE TRANSFORMER DESIGN FOR AN ION MOLAR APPLICATION UNDER CONDITIONS COMPATIBLE WITH THE OTHER CIRCUIT ELEMENTS WITH THE AIM OF OBTAINING IMPROVEMENTS IN EFFICIENCY AND REDUCTION IN MASS. TRANSFORMERS PRODUCED FROM THE RESULTING DESIGNS FEATURED EFFICIENCIES IN EXCESS OF 98PERCENT AND MASSES SOME 25PERCENT LESS THAN THEIR PREDECESSORS

717924   B7503984, C7503268
MEASUREMENT OF INDICATED MEAN EFFECTIVE PRESSURE OF A RECIPROCATING ENGINE WITH A MINICOMPUTER
SHINOYAMA, E., YANAGIHARA, S.
J. MECH. ENG. LAB. (JAPAN)   VOL.28, NO.1   17-20   JAN. 1974
CODEN: KGKSBL
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, PRESSURE MEASUREMENT
IDENTIFIERS: ENGINEERING APPLICATION OF COMPUTERS, INTERNAL COMBUSTION ENGINES, MEASUREMENT OF INDICATED MEAN EFFECTIVE PRESSURE, RECIPROCATING ENGINE, MINICOMPUTER, STROKE SIGNAL GENERATOR, TWO STROKE GASOLINE ENGINE
SECTION CLASS CODES: C8847, B4449, C7449
UNIFIED CLASS CODES: WMEMAD, BKETAB
LANGUAGE: JAPANESE
DESCRIBES THE METHOD WHICH HAS BEEN DEVELOPED TO REDUCE THE INDICATED MEAN EFFECTIVE PRESSURE (I.M.E.P.) OF EACH CYCLE AND A CONTINUOUS 1000 CYCLES, BY USING A MINICOMPUTER AND STROKE SIGNAL GENERATOR. THE STROKE IS DIVIDED INTO TWENTY PARTS HAVING THE SAME VOLUME AND THE REPRESENTATIVE CYLINDER PRESSURE DETECTED BY A PRECISION PRESSURE PICK-UP IS SAMPLED WITH THE COMPUTER AT THE MID-POINT OF EACH DIVIDED STROKE. IN THE DIGITAL COMPUTER THE PRESSURE SIGNALS ARE PROCESSED IN REAL TIME (ON LINE) AND I.M.E.P. AND THE OTHER VALUES OF EACH CYCLE ARE MEMORIZED. THE METHOD WAS APPLIED TO A TWO STROKE GASOLINE ENGINE AND THE RESULTS WERE COMPARED WITH ENGINE DYNAMOMETER TORQUE   (2 REFS)

708959 B75016l4, C7501314
PREDICTION OF PRESSURE AND FLOW TRANSIENTS IN A GASEOUS BIPROPELLANT REACTION CONTROL ROCKET ENGINE
MARKOWSKY, J.J. ; AMERICAN ELECTRIC POWER SERVICE CORP., NEW YORK
COMPUT. AND FLUIDS (GB) VOL. 2 NO. 2 145-61 AUG. 1974 CODEN: CPFLBI
DESCRIPTORS: ROCKETS, COMBUSTION, CONTROL SYSTEMS, COMPUTER-AIDED ANALYSIS, AEROSPACE APPLICATIONS OF COMPUTERS
IDENTIFIERS: UPSTREAM WEIGHTED DIFFERENCING SCHEMES, MASS TRANSFER, PRESSURE TRANSIENTS, H/SUB 2/+O/SUB 2/ REACTION, CONTINUITY EQUATIONS, FLOW TRANSIENTS, GASEOUS BIPROPELLANT REACTION CONTROL ROCKET ENGINE, VALVES, MANIFOLDS, INJECTORS, FEEDLINE, MANIFOLD VOLUME, IBM 360/65, COMBUSTION LAG TIME, FORTRAN IV
SECTION CLASS CODES: B4710, C8849, C7875
UNIFIED CLASS CODES: ZLCAAJ, WMEZAN, VMRMAY
AN ANALYTIC MODEL IS DEVELOPED TO PREDICT PRESSURE AND FLOW TRANSIENTS IN A GASEOUS HYDROGEN-OXYGEN REACTION CONTROL ROCKET ENGINE FEED SYSTEM. THE ONE-DIMENSIONAL EQUATIONS OF MOMENTUM AND CONTINUITY ARE REDUCED BY THE METHOD OF CHARACTERISTICS FROM PARTIAL DERIVATIVES TO A SET OF TOTAL DERIVATIVES WHICH DESCRIBE THE STATE PROPERTIES ALONG THE FEEDLINE. SYSTEM COMPONENTS, E.G. VALVES, MANIFOLDS AND INJECTORS ARE REPRESENTED BY PSEUDO STEADY-STATE RELATIONS AT DISCRETE JUNCTIONS IN THE SYSTEM. SOLUTIONS WERE EFFECTED BY A FORTRAN IV PROGRAM ON AN IBM 360/65. THE RESULTS INDICATE THE RELATIVE EFFECT OF MANIFOLD VOLUME, COMBUSTION LAG TIME, FEEDLINE PRESSURE FLUCTUATIONS, PROPELLANT TEMPERATURE, AND FEEDLINE LENGTH ON THE CHAMBER PRESSURE TRANSIENT. THE ANALYTICAL COMBUSTION MODEL IS VERIFIED BY GOOD CORRELATION BETWEEN PREDICTED AND OBSERVED CHAMBER PRESSURE TRANSIENTS (15 REFS)

708920 C7501275
COMPUTER-AIDED DESIGN OF THERMALLY LOADED AXISYMMETRIC DIESEL ENGINE COMPONENTS
TOMLINSON, G.R., LEONARD, R., HENSHALL, S.H. ; MANCHESTER POLYTECH., ENGLAND
COMPUT. AIDED DES. (GB) VOL. 6 NO. 3 132-5 JULY 1974 CODEN: CAIDA5
DESCRIPTORS: COMPUTER AIDED DESIGN, FINITE ELEMENT ANALYSIS, STRESS ANALYSIS, INTERNAL COMBUSTION ENGINES
IDENTIFIERS: THERMALLY LOADED AXISYMMETRIC DIESEL ENGINE COMPONENTS, FINITE ELEMENT METHODS, DESIGN, PISTON CROWNS: CYLINDER LINERS, EXHAUST VALVES, PISTON RING GROOVE DISTORTION, EXHAUST VALVE TEMPERATURES, LINER STRESSES
SECTION CLASS CODES: C8847
UNIFIED CLASS CODES: WMEMAD
DESCRIBES THE USE OF FINITE ELEMENT METHODS FOR THE DESIGN OF PISTON CROWNS CYLINDER LINERS AND EXHAUST VALVES AND IT IS SHOWN THAT A MARKED CORRELATION EXISTS BETWEEN PREDICTED AND MEASURED RESULTS. HENCE FACTORS SUCH AS PISTON RING GROOVE DISTORTION EXHAUST VALVE TEMPERATURE AND LINER STRESSES CAN BE REALLY EVALUATED AT REASONABLE COST (8 REFS)

701431 C7424923
DIGITAL SIMULATION OF STATIONARY GAUSSIAN LOADS
KANEMATSU, H., NASH, W.A. ; UNIV. MASSACHUSETTS, AMHERST, USA
; POLISH ACAD. SCI. ET AL
ZAGADNIENIA DRGAN NIELINIOWYCH (POLAND) 247-65 1974 CODEN: ZDWIAD
CONF: 6TH INTERNATIONAL CONFERENCE ON NONLINEAR OSCILLATIONS 29 AUG. - 4 SEPT. 1972 POLISH ACAD. SCI. ET AL POZNAN, POLAND
DESCRIPTORS: RANDOM NUMBER GENERATION, SIMULATION, RANDOM PROCESSES
IDENTIFIERS: DIGITAL SIMULATION, STATIONARY GAUSSIAN LOADS, FILTERED WHITE NOISE RANDOM PROCESS, LINEAR FILTER, JET ENGINE SOUND PRESSURES, BOUNDARY LAYER PRESSURE FLUCTUATIONS, GUST LOADINGS, ATMOSPHERIC TURBULENCE
SECTION CLASS CODES: C8890, C8812
UNIFIED CLASS CODES: WMZAAF, WMCEAA
LANGUAGE: ENGLISH
THIS STUDY IS CONCERNED WITH A DIGITAL SIMULATION TECHNIQUE FOR REPRESENTING A NON-WHITE STATIONARY GAUSSIAN RANDOM PROCESS. A FILTERED WHITE NOISE RANDOM PROCESS IS OBTAINED BY PASSING AN APPROXIMATE WHITE NOISE RANDOM PROCESS THROUGH A LINEAR FILTER. AS APPLICATIONS, JET ENGINE SOUND PRESSURES, BOUNDARY LAYER PRESSURE FLUCTUATIONS, AND GUST LOADINGS IN ATMOSPHERIC TURBULENCE ARE SIMULATED BY USING VARIOUS TYPES OF FIRST AND SECOND ORDER LINEAR FILTERS (10 REFS)

693717 C7422473
DIGITAL ENGINE CONTROL SYSTEM FOR FUEL-INJECTION AND IGNITION TIMING
BREIMESSER, F., KUZNIA, CH. ; SIEMENS AG MUNCHEN, GERMANY
; CONVENTION OF NAT. SOC. ELECTRICAL ENGRS. WESTERN EUROPE, IEEE
EUROPEAN CONFERENCE ON ELECTROTECHNICS. EUROCON :74 DIGEST. (EXTENDED ABSTRACTS ONLY) B5-12/2PP. 1974
22-26 APRIL 1974 CONVENTION OF NAT. SOC. ELECTRICAL ENGRS. WESTERN EUROPE, IEEE AMSTERDAM, NETHERLANDS
PUBL: ROYAL INSTN. ENGRS., NETHERLANDS THE HAGUE, NETHERLANDS
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, AUTOMOBILES, FUEL, IGNITION, DIGITAL CONTROL, TABLE LOOKUP
IDENTIFIERS: AUTOMOTIVE APPLICATIONS, DIGITAL COMPUTERIZED SYSTEM, IGNITION TIMING, TABLE LOOKUP, INTERPOLATION, THROTTLE ANGLE, ENGINE SPEED, FUEL INJECTION CONTROL
SECTION CLASS CODES: C7851, C8846, C8440, C7871
UNIFIED CLASS CODES: VMKCAD, WMEKAS, WGEAAJ, VMRCAZ
A DIGITAL COMPUTERIZED SYSTEM FOR THE ACCURATE CONTROL OF THE FUEL-TO-AIR RATIO AND THE IGNITION TIMING HAS BEEN DEVELOPED. EXPERIMENTS SHOWED A CONSIDERABLE REDUCTION OF EXHAUST EMISSIONS AND FUEL CONSUMPTION. TO GENERATE THE CONTROL SIGNALS, A TABLE LOOKUP TECHNIQUE WITH INTERPOLATION IS USED. THE TWO PARAMETERS WHICH DEFINE THE OPERATING CONDITION OF THE ENGINE, NAMELY THE THROTTLE ANGLE AND THE ENGINE SPEED, ARE USED FOR TABLE ENTRANCE

683813 B7435293, C7421849
RB199 RELATED SUB-SYSTEMS AND ASSOCIATED COMPONENTS
AIRCR. ENG. (GB) VOL.46, NO.5 9-10, 13-16 MAY 1974 CODEN: AIENAP
DESCRIPTORS: AEROSPACE PROPULSION, AEROSPACE ENGINES, AIRCRAFT, CLOSED LOOP SYSTEMS, AEROSPACE CONTROL, AEROSPACE APPLICATIONS OF COMPUTERS, HEAT EXCHANGERS, AEROSPACE INSTRUMENTATION, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: MRCA, RB199 ENGINE, DIGITAL AIR INTAKE CONTROLLER, FUEL COOLED OIL COOLER, AIR COOLED FUEL COOLER, FUEL SYSTEM PRESSURE REDUCING VALVES, HIGH ENERGY IGNITION UNIT, TURBINE BLADE PYROMETER AMPLIFIER, NORD-MICRO GMBH, HAWKER SIDDELEY DYNAMICS, MAGNETI MARELLI, AIR INTAKE ANTI/DEICING SYSTEM, INTEGRATED PUMP AND CONTROL SYSTEM, AUXILIARY POWER UNIT, GEARBOX CONTROL UNIT, PRECOOLER OUTLET TEMPERATURE CONTROL, WATER EXTRACTOR, VARIABLE GEOMETRY AIR INDUCTION, AERODYNAMICALLY CLOSED LOOP
SECTION CLASS CODES: B4740, C8846, C8849, C7875
UNIFIED CLASS CODES: ZLGAAP, WMEKAS, WMEZAN, VMRMAY
DESCRIBES FEATURES OF THE MRCA RELATED TO THE RB199 ENGINE, INCLUDING: DIGITAL AIR INTAKE CONTROLLER, AIR INTAKE ANTI-ICE SYSTEM, FUEL COOLED OIL COOLER, AIR COOLED FUEL COOLER, FUEL SYSTEM PRESSURE REDUCING VALVES, HIGH ENERGY IGNITION UNIT AND THE TURBINE BLADE PYROMETER AMPLIFIER. FIRMS PARTICIPATING IN THESE DEVELOPMENTS INCLUDE NORD-MICRO GMBH, HAWKER SIDDELEY DYNAMICS AND MAGNETI MARELLI

674355 C7419467
AN EXPERIMENTAL INVESTIGATION INTO DUPLEX DIGITAL CONTROL OF AN ENGINE WITH REHEAT
EVANS, J.F.O., HELPS, K.A.
; AGARD
AGARD CONFERENCE PROCEEDINGS NO. 137 ON ADVANCES IN CONTROL SYSTEMS 16/1-14 1974
24-26 SEPT. 1973 AGARD GEILO, NORWAY
PUBL: AGARD NEUILLY SUR SEINNE
DESCRIPTORS: AEROSPACE ENGINES, AEROSPACE CONTROL, DIRECT DIGITAL CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, AEROSPACE APPLICATIONS OF COMPUTERS
IDENTIFIERS: DUPLEX DIGITAL CONTROL, ENGINE WITH REHEAT, CROSS MONITORING COMPUTERS, HYDROMECHANICAL BACK UP SYSTEM
SECTION CLASS CODES: C7875, C8846, C8849
UNIFIED CLASS CODES: VMRMAY, WMEKAS, WMEZAN
DESCRIBES AN EXPERIMENTAL INVESTIGATION INVOLVING THE CONTROL OF A P.S. 50 ENGINE BY A PAIR OF CROSS-MONITORING COMPUTERS WITH A HYDROMECHANICAL BACK-UP SYSTEM. THE CONTROLLER WAS DEVELOPED JOINTLY BY SMITHS INDUSTRIES LIMITED, AND DOWTY FUEL SYSTEMS LIMITED, AND WAS COMMISSIONED AND RUN IN LATE 1972 AT THE D.F.S. TEST BED AT STAVERTON, ENGLAND. THE P.S. 50 IS A SINGLE SPOOL ENGINE WITH MULTI-MANIFOLD REHEAT

662848 B74278O1, C7416947
A :SPEEDY: APPROACH TO DIGITAL FREQUENCY METERING
CREASEY, D.
ELECTRON. EQUIP. NEWS (GB) VOL.15, NO.11 64-5 APRIL-MAY
19.TEGE TRS A O OLL7 O CODEN: EEQNAW
DESCRIPTORS: FREQUENCY METERS, INTERNAL COMBUSTION ENGINES, GAS TURBINES, TACHOMETERS, DIGITAL INSTRUMENTATION
IDENTIFIERS: INTERNAL COMBUSTION ENGINES, AIRCRAFT TURBINE ENGINES, PERFORMANCE ADJUSTMENT, GAS TURBINE ENGINES, ENGINE DEVELOPMENT, DIGITAL FREQUENCY METERING
SECTION CLASS CODES: B4424, B4442, B5240, B4270, C7660
UNIFIED CLASS CODES: BKCKAZ, BKEEAM, TEGAAX, BECRAX
DISCUSSES APPLICATION TO INTERNAL COMBUSTION ENGINES AND AIRCRAFT TURBINE ENGINES FOR PERFORMANCE ADJUSTMENT

641129 A74391135, C7412723
NOISE MEASUREMENT ON A V-6 DIESEL ENGINE
CHUNG, J.Y., CROCKER, M.J., HAMILTON, J.F. ; PURDUE UNIV., WEST LAFAYETTE, IND., USA
TREE, D.R.
; INST. NOISE CONTROL ENGNG
1973 NATIONAL CONFERENCE ON NOISE CONTROL ENGINEERING 86-91 1973
15-17 OCT. 1973 INST. NOISE CONTROL ENGNG WASHINGTON, D.C., USA
PUBL: INST. NOISE CONTROL ENGNG. POUGHKEEPSIE, N.Y., USA
DESCRIPTORS: NOISE ABATEMENT, ACOUSTIC NOISE, INTERNAL COMBUSTION ENGINES, FOURIER ANALYSIS, ACOUSTIC INTENSITY MEASUREMENT
IDENTIFIERS: NOISE SPECTRA, DIGITAL FOURIER ANALYSER, STRUCTURAL ATTENUATION, DIESEL ENGINE NOISE, VEE 6 DIESEL ENGINE
SECTION CLASS CODES: A9890, C7455
UNIFIED CLASS CODES: ZCZAEZ, VGEZAP
THE MEASUREMENTS OF THE NOISE SPECTRA WHICH ARE SHOWN IN THIS PAPER HAVE BEEN MADE BY MEANS OF A DIGITAL FOURIER ANALYSER. THE MAIN PURPOSE OF THE PAPER IS TO DISCUSS THE STRUCTURAL ATTENUATION OF THE DIESEL ENGINE NOISE

618181 B7412495, C7408932
BEAM DIAGNOSTICS OF THE RIT 10-ENGINE
ALTENBURG, W., GRISEL, J. ; GIESSEN UNIV., GERMANY
; IEE, UKAEA
STD BOOK NO.: 0 85296119 7
CONFERENCE ON ELECTRIC PROPULSION OF SPACE VEHICLES 48-52 1973
10-12 APRIL 1973 IEE, UKAEA ABINGDON, BERKS., ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: ION ENGINES, ION BEAMS, AEROSPACE ENGINES, COMPUTER-AIDED ANALYSIS, AEROSPACE APPLICATIONS OF COMPUTERS, DATA REDUCTION AND ANALYSIS, ELECTRIC PROPULSION
IDENTIFIERS: RIT 10 ENGINE, ION THRUSTERS, BEAM DIAGNOSTICS, ANGULAR DISTRIBUTION, ENERGY, CHARGE SPECTRUM, DIVERGENCE EFFICIENCY, THRUST VECTOR DEVIATION, INTEGRATED BEAM CURRENT
SECTION CLASS CODES: B4760, C8849
UNIFIED CLASS CODES: ZLKAAM, WMEZAN
TO DETERMINE THE BEAM DATA OF RIT 10- THRUSTERS, E.G. THE ANGULAR DISTRIBUTION, ENERGY CHARGE SPECTRUM, THE DIVERGENCE EFFICIENCY, AN EVENTUAL THRUST VECTOR DEVIATION AS WELL AS THE INTEGRATED BEAM CURRENT, A SPECIAL BEAM DIAGNOSTIC APPARATUS HAS BEEN BUILT UP IN THE PUMPING FACILITY :P 6000:. BY USING DIFFERENT MOVABLE PROBES WHICH ARE DRIVEN BY THREE ELECTRIC MOTORS, THE BEAM REGION UP TO 1 M DISTANCE FROM THE THRUSTER EXIT CAN BE SCANNED CONTINUOUSLY. THE DATA PICKED UP BY THE PROBE (ABOUT 30000 FOR EACH PROFILE) ARE FED TO A DIGITAL COMPUTER (HONEYWELL H 316) WHICH PLOTS THE PROFILE CARDS AND PRINTS THE ABOVE MENTIONED PERFORMANCE DATA. FIRST EXPERIMENTAL RESULTS ARE GIVEN (4 REFS)

618174 C7408925
ENGINE DATA LOGGED FASTER BY COMPUTER
SYSTEMS (GB) VOL.1, NO.2 22-3 OCT. 1973
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, DATA ACQUISITION, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: INTERNAL COMBUSTION ENGINE, PERFORMANCE, DATA ACQUISITION SYSTEM, COMPUTER
SECTION CLASS CODES: C8849
UNIFIED CLASS CODES: WMEZAN
THE NEED FOR AUTOMATION IN MONITORING INTERNAL COMBUSTION ENGINE PERFORMANCE HAS BEEN RECOGNISED BY MANY ORGANISATIONS INCLUDING THE SOUTHWEST RESEARCH INSTITUTE, TEXAS, WHERE PROJECTS INVOLVE THE EVALUATION OF DIESEL AND PETROL ENGINES FOR FUEL ECONOMY, LUBRICATION PERFORMANCE, OCTANE REQUIREMENTS, HYDROCARBON EMISSION ETC. RECENTLY THE SINGLE-CYLINDER CATERPILLAR ENGINE LABORATORY THAT CAN MONITOR 50 ENGINES SIMULTANEOUSLY HAS BEEN AUTOMATED WITH A HEWLETT-PACKARD SENSOR-BASED DATA ACQUISITION SYSTEM

606068 B7405160, C7406042

A COMPUTER-CONTROLLED ENGINE TEST CELL FOR ENGINEERING EXPERIMENTS

RILLINGS, J.H., CREPS, W.D., VORA, L.S. ; GENERAL MOTORS RES. LABS., WARREN, MICH., USA

PROC. IEEE (USA) VOL.61, NO.11 1622-6 NOV. 1973 CODEN: IEEPAD

DESCRIPTORS: AUTOMATIC TEST EQUIPMENT, AUTOMOBILES, INTERNAL COMBUSTION ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, ENGINEERING APPLICATIONS OF COMPUTERS, DATA ACQUISITION, DATA REDUCTION AND ANALYSIS, COMPUTER-AIDED ANALYSIS

IDENTIFIERS: AUTOMOTIVE ENGINES, DATA ACQUISITION, COMPUTER CONTROLLED ENGINE TEST CELL

SECTION CLASS CODES: B1269, C8849, C7851

UNIFIED CLASS CODES: ADGMAE, WMEZAN, VMKCAD

A COMPUTER-CONTROLLED ENGINE TEST CELL WAS DEVELOPED FOR CONDUCTING COMPLEX TRANSIENT EXPERIMENTS WITH AUTOMOTIVE ENGINES. THE TEST CELL USES A MINICOMPUTER WITH A 16000-WORD 16-B CORE MEMORY TO PERFORM DATA ACQUISITION AND CLOSED-LOOP CONTROL OF THE ENGINE AND DYNAMOMETER. A TABLE-DRIVEN REAL-TIME CONTROL PROGRAM IS USED TO DUPLICATE THE EFFECTS OF VEHICLE, TRANSMISSION, AND ROAD ON ENGINE OPERATION. REFERENCE DATA AND ACQUIRED DATA ARE EXCHANGED OVER A HIGH-SPEED COMMUNICATIONS CHANNEL BETWEEN THE MINICOMPUTER AND A CENTRALIZED DATA ACQUISITION COMPUTER (DAC) SYSTEM. DATA CAN BE PLOTTED AGAINST TIME OR CROSS-PLOTTED AGAINST OTHER PARAMETERS ON A GRAPHIC CATHODE-RAY-TUBE DISPLAY PERIPHERAL TO THE MINICOMPUTER. THE USER CAN INTERACT WITH THE SYSTEM TO CHANGE PARAMETERS DURING THE RUNNING OF AN EXPERIMENT (2 REFS)

58598* C7401117
SOLUTION IMPROVEMENT IN COMPUTERIZED STRUCTURAL ANALYSIS SIMULATION
PITTS, G.N., BATEMAN, B. ; CENTRAL TEXAS COLL., KILLEEN, USA
; ISA, ET AL
STD BOOK NO.: I
PROCEEDINGS OF THE 1973 SUMMER COMPUTATION SIMULATION CONFERENCE
476-8 1973
13-19 JULY 1973 ISA, ET AL MONTREAL, QUEBEC, CANADA
PUBL: SIMULATION COUNCIL LA JOLLA, CALIF., USA
DESCRIPTORS: AEROSPACE SIMULATION, AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE ENGINES, COMPUTER AIDED ANALYSIS, NUMERICAL ANALYSIS
IDENTIFIERS: STRUCTURAL ANALYSIS, SIMULATION, AIRCRAFT, ROCKET, ENGINE
SECTION CLASS CODES: C8849, C8200
UNIFIED CLASS CODES: WMEZAN, DLTAAE
WITH THE STATE OF THE ART IN AIRCRAFT AND ROCKET ENGINE DESIGN REACHING AN UNPRECEDENTED HEIGHT, STRUCTURAL ANALYSIS HAS BECOME AN EXTREMELY DIFFICULT TASK. THE ENGINEER IS FACED WITH THE COMPLEX PROBLEM OF AN ENGINE OPERATING AT VERY HIGH TEMPERATURE WITH EXCEPTIONALLY LARGE STRESSES AND STRAINS. SINCE MANY STRUCTURAL PROBLEMS CAN BE SIMULATED WITH SYSTEMS OF NONLINEAR SIMULTANEOUS EQUATIONS, MUCH TIME AND EFFORT HAS BEEN SPENT ON DEVELOPING VARIOUS METHODS TO SOLVE THESE SYSTEMS. THE SOLUTION METHOD PRESENTED IN THIS PAPER IS A COMBINATION AND MODIFICATION OF METHODS WHICH RESULTS IN A SIGNIFICANT DECREASE IN SOLUTION COST AND EXECUTION TIME. THE PROPOSED METHOD IS CHARACTERIZED BY RAPID CONVERGENCE AND LESS CRITICAL INITIAL APPROXIMATIONS (4 REFS)

585971 C7401103
SIMULATION OF THERMODYNAMIC PROCESS OF A DIESEL ENGINE ON A SMALL DIGITAL COMPUTER
OJHA, V.P. ; DIESEL LOCOMOTIVE WORKS, VARANASI, INDIA
J. INST. ENG. (INDIA) MECH. ENG. DIV. VOL.53, PT.ME6 292-301
JULY 1973 CODEN: JEMDAS
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, SIMULATION, THERMODYNAMICS , MODELLING, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SIMULATION, THERMODYNAMIC PROCESS, DIESEL ENGINE, SMALL DIGITAL COMPUTER, MATHEMATICAL MODEL
SECTION CLASS CODES: C8849
UNIFIED CLASS CODES: WMEZAN
THIS PAPER DISCUSSES A MATHEMATICAL MODEL FOR SIMULATING THE THERMODYNAMIC PROCESS OF A DIESEL ENGINE. THE MODEL HAS BEEN USED TO PREDICT THE PERFORMANCE OF 251B, 16 CYLINDER DIESEL ENGINES BEING MANUFACTURED AT THE DIESEL LOCOMOTIVE WORKS VARANASI. SOME OF THE CHARACTERISTICS LIKE HEAT RELEASE PATTERN, HEAT TRANSFER COEFFICIENTS AND EFFICIENCIES OF TURBO COMPONENTS WERE EITHER ASSUMED OR OBTAINED FROM THE TEST BED RESULTS. THE EFFICACY OF THIS MODEL IS ILLUSTRATED BY PREDICTING THE PERFORMANCE OF THE SAME ENGINE WORKING AT A DIFFERENT SPEED AND RATING. THIS MODEL IS COMPACT, WHICH ENABLES IT TO BE COMPUTERISED FOR SMALL COMPUTERS LIKE THE 140 VERSION OF IBM SERIES OF DATA PROCESSING MACHINES WITH A STORAGE CAPACITY OF 12K (11 REFS)

573749 C73235408
THE USE OF A HYBRID COMPUTER IN THE OPTIMIZATION OF GAS TURBINE CONTROL PARAMETERS
SARAVANAMUTTOO, H.I.H., MACISAAC, B.D. ; CARLETON UNIV., OTTAWA, CANADA
TRANS. ASME SER. A (USA) VOL.95, NO.3 257-64 JULY 1973
CODEN: JRPOA8
DESCRIPTORS: HYBRID COMPUTER METHODS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, GAS TURBINES, OPTIMISATION, SIMULATION, AUTOMATIC CONTROL
IDENTIFIERS: SINGLE SPOOL, TURBOJET ENGINE, AUTOMATIC CONTROL, HYBRID COMPUTER, OPTIMIZATION, GAS TURBINE, CONTROL PARAMETERS, SIMULATION, THRUST RESPONSE, ENGINE DYNAMICS
SECTION CLASS CODES: C7851, C8846, C8849
UNIFIED CLASS CODES: VMKCAD, WMEKAS, WMEZAN
THE PAPER DISCUSSES THE HYBRID COMPUTER SIMULATION OF A SINGLE-SPOOL TURBOJET ENGINE. THE PROBLEM IS APPROACHED FROM THE VIEWPOINT OF ENGINEERING THERMODYNAMICS, USING THE NORMAL COMPRESSOR AND TURBINE CHARACTERISTICS. THIS WAS FOUND TO YIELD AN EXTREMELY FLEXIBLE SIMULATION CAPABLE OF OPERATION OVER THE ENTIRE RUNNING RANGE. THE SIMULATION WAS USED TO INVESTIGATE METHODS OF IMPROVING THE THRUST RESPONSE AND IT WAS FOUND THAT A DETAILED INSIGHT INTO THE ENGINE DYNAMICS PERMITTED A SIGNIFICANT IMPROVEMENT IN THRUST RESPONSE (6 REFS)

564358 C7322595
PROCESSING ENGINE TEST DATA USING SPEED
WARMAN, E.A., SCOTT, S.W.
; IEE, ET AL
STD BOOK NO.: 0 85296114 6
CONFERENCE ON THE USE OF DIGITAL COMPUTERS IN MEASUREMENT 94-8 1973
24-27 SEPT. 1973 IEE, ET AL YORK, ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, MACHINE TESTING, COMPUTER AIDED ANALYSIS
IDENTIFIERS: PROCESSING, ENGINE, TEST DATA, SPEED, COMPUTERS
SECTION CLASS CODES: C8849
UNIFIED CLASS CODES: WMEZAN
SPEED: A SYSTEM FOR PROCESSING EXPERIMENTAL ENGINE DATA IS A SYSTEM OF HARDWARE AND SOFTWARE BEING DEVELOPED BASICALLY FOR THE OFF LINE PROCESSING OF MEASUREMENT DATA FROM ENGINES. THE AIM HAS BEEN TO CREATE FLEXIBILITY OF USE. A BUILDING BLOCK CONSTRUCTION OF EQUIPMENT HAS BEEN EMPLOYED. TO DATE THE EQUIPMENT HAS RESOLVED INTO A PERMANENT INSTALLATION IN THE NOISE FACILITY: AND A PORTABLE SYSTEM (2 REFS)

555037 B7333727, C7320776
GUIDELINES IN DESIGNING A DIGITAL DATA ACQUISITION SYSTEM
WESTWICK, J.E. ; GENERAL MOTORS CORP., INDIANAPOLIS, IND., USA
ROBERTS, R.R.
: ISA
STD BOOK NO.: 87664 182 6
PROCEEDINGS OF THE 18TH INTERNATIONAL ISA AEROSPACE INSTRUMENTATION SYMPOSIUM, VOL.18 29-35 1972
15-17 MAY 1972 ISA MIAMI, FLA., USA
PUBL: ISA PITTSBURGH, PA., USA
DESCRIPTORS: DATA ACQUISITION, GAS TURBINES, AEROSPACE TEST FACILITIES, REAL-TIME SYSTEMS, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: DESIGN, SOLID STATE HIGH SPEED COMPUTER HARDWARE, AEROSPACE, INDUSTRIAL, GAS TURBINE ENGINE DEVELOPMENT, HIGH SPEED, TRANSIENT CONDITIONS, GRAPHIC OUTPUT, REAL TIME OPERATION, DIGITAL DATA ACQUISITION SYSTEM
SECTION CLASS CODES: C8849, B4720, B5244
UNIFIED CLASS CODES: WMEZAN, ZLBAAZ, TEGEAT
DIGITAL DATA ACQUISITION SYSTEM DEVELOPMENT AND DESIGN HAS BECOME MORE SOPHISTICATED WITH THE AVAILABILITY OF SOLID STATE HIGH SPEED COMPUTER HARDWARE AND :REAL-TIME: MONITOR SOFTWARE. THE NEWLY INSTALLED SYSTEM AT DETROIT DIESEL ALLISON SUPPORTS AEROSPACE AND INDUSTRIAL GAS TURBINE ENGINE DEVELOPMENT TEST PROGRAMS BY PROVIDING HIGH SPEED ACQUISITION OF DATA, DISPLAY OF REAL- TIME PERFORMANCE TO THE TEST ENGINEER USING THE ACQUIRED DATA, AND QUICK RETURN OF FINAL PERFORMANCE RESULTS IN GRAPHIC AND TABULAR FORM. THE SYSTEM IS USED ALSO TO RECORD TRANSIENT CONDITIONS OF PERFORMANCE AND PROVIDE GRAPHIC OUTPUT OF THESE CONDITIONS FOR ANALYSIS

555002 B7333730, C7320740
DEVELOPMENT OF A DIGITAL CONTROL SYSTEM FOR A SPACECRAFT PROPULSION TEST FACILITY

SMALLEY, R.R. ; NASA, PLUM BROOK STATION, SANDUSKY, OHIO, USA
ROBERTS, R.R.
: ISA

STD BOOK NO.: 87664 182 6
PROCEEDINGS OF THE 18TH INTERNATIONAL ISA AEROSPACE INSTRUMENTATION SYMPOSIUM, VOL.18 69-72 1972
15-17 MAY 1972 ISA MIAMI, FLA., USA
PUBL: ISA PITTSBURGH, PA., USA
DESCRIPTORS: AEROSPACE PROPULSION, AEROSPACE TEST FACILITIES, CONTROL SYSTEMS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: CONTROL SYSTEM, SPACECRAFT PROPULSION TEST FACILITY, DIGITAL COMPUTER CONTROL, ABORT SYSTEM, ROCKET ENGINE TESTING, STRUCTURE TESTING, WIND TUNNEL TESTS, CONTROL FUNCTION UPDATING, CONTINUOUS ABORT MONITORING, SOFTWARE, SHORT DURATION TESTS, HARDWARE
SECTION CLASS CODES: B4720, C8846, C7875
UNIFIED CLASS CODES: ZLEAAZ, WMEKAS, VHRMAY

A DIGITAL COMPUTER CONTROL AND ABORT SYSTEM WHICH IS USED AT NASA-LEWIS RESEARCH CENTER:S PLUM BROOK TEST FACILITIES IS DESCRIBED. THE SYSTEM WAS DESIGNED BY NASA PERSONNEL TO CONTROL TEST OPERATIONS SUCH AS ROCKET ENGINE TESTING, STRUCTURE TESTING, AND WIND TUNNEL TESTS. BECAUSE OF THE NATURE OF SPACECRAFT SYSTEM TESTING, PARTICULARLY ROCKET ENGINE TESTING, THE UNIQUE FEATURES OF THE SYSTEM ARE, CONTROL FUNCTION UPDATING AT A 20 MILLISECOND RATE, CONTINUOUS ABORT MONITORING AND A SOFTWARE SYSTEM DESIGNED FOR SHORT DURATION TESTS RATHER THAN CONTINUOUS ON-LINE CONTROL. TO ACCOMPLISH THESE SYSTEM REQUIREMENTS, SPECIAL HARDWARE WAS DESIGNED

555001 B7333728, C7320739
SUPERVISORY COMPUTER CONTROL OF JET ENGINE DUAL COMPRESSOR TESTS
GOODWIN, W., SELLECK, F.G., WATERMAN, A. ; UNITED AIRCRAFT CORP., EAST HARTFORD, CONN., USA
ROBERTS, R.R.
; ISA
STD BOOK NO.: 87664 182 6
PROCEEDINGS OF THE 18TH INTERNATIONAL ISA AEROSPACE INSTRUMENTATION SYMPOSIUM, VOL.18 37-47 1972
15-17 MAY 1972 ISA MIAMI, FLA., USA
PUBL: ISA PITTSBURGH, PA., USA
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE TEST FACILITIES, AEROSPACE ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, CONTROL SYSTEMS, COMPRESSORS
IDENTIFIERS: SUPERVISORY COMPUTER CONTROL, JET ENGINE DUAL COMPRESSOR, DIGITAL COMPUTER CONTROLLED, TESTING, COAXIAL GAS TURBINE, OPERATING PARAMETERS, AERODYNAMIC CONDITIONS, RELIABILITY, FLEXIBILITY , SYSTEM DESIGN
SECTION CLASS CODES: B4720, C8846, C7851
UNIFIED CLASS CODES: ZLEAAZ, WMEKAS, VMKCAD
DIGITAL COMPUTER CONTROLLED TESTING OF SEPARATELY DRIVEN COAXIAL GAS TURBINE LOW PRESSURE AND HIGH PRESSURE COMPRESSORS, REFERRED TO AS :DUAL COMPRESSOR TESTING,: HAS BEEN IMPLEMENTED SUCCESSFULLY. THE SUPERVISORY CONTROL SYSTEM MEASURES, COMPUTES, AND CONTROLS DUAL COMPRESSOR OPERATING PARAMETERS, MAINTAINING DESIRED AERODYAMIC CONDITIONS DURING TESTS. THIS ACHIEVED BY COMPUTER CONTROL OF TWO GAS TURBINE DRIVE ENGINES OF 18000 HP AND 35000 HP, AND SIX FAST-ACTING CONTROL VALVES, RANGING UP TO SIX FEET IN DIAMETER. RELIABILITY AND FLEXIBILITY WERE EMPHASIZED IN THE SYSTEM DESIGN

546160 C7318686
AN ENGINE TEST LANGUAGE FOR COMPUTER CONTROL OF ENGINE TESTS
WARMAN, E.A.
; IEE, ET AL
STD BOOK NO.: 0 85296111 1
CONFERENCE ON SOFTWARE FOR CONTROL 137-44 1973
17-19 JULY 1973 IEE, ET AL WARWICK, ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: AUTOMATIC TESTING, HEAT ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, PROBLEM-ORIENTED LANGUAGES
IDENTIFIERS: ENGINE TEST LANGUAGE, COMPUTER CONTROL, ENGINE TESTS, GET L
SECTION CLASS CODES: C8314, C7851, C8846
UNIFIED CLASS CODES: WECEAR, VMKCAD, WMEKAS
A RESEARCH INVESTIGATION INTO THE POSSIBLE LEVELS OF AUTOMATION AND COMPUTER INVOLVEMENT IN ENGINE TESTING INDICATED IT WOULD BE DESIRABLE TO DEVELOP A PROGRAMMING LANGUAGE FOR DESCRIBING ENGINE TESTING SEQUENCES. WORK SUBSEQUENT TO THIS INVESTIGATION IS NOW CONCERNED WITH EXPANDING THIS LANGUAGE TO ALLOW IT TO DEAL WITH ANY PROCESS SEQUENCING SITUATION (5 REFS)

526710 C7315029
THE SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEM OF THE KARL LIEBKNECHT WORKS AT MAGDEBURG
KARSTEN, E. ; VEB SCHWERMASCHINENBAU :KARL LIEBKNECHT:, MAGDEBURG, GERMANY
INFORMATIK (GERMANY) VOL.20, NO.1 12-14 1973 CODEN: IIDWAN
DESCRIPTORS: INFORMATION DISSEMINATION, INFORMATION CENTRES, INFORMATION USE, INFORMATION RETRIEVAL SYSTEMS, MINICOMPUTERS
IDENTIFIERS: SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEM, EAST GERMAN DEMOCRATIC REPUBLIC, INFORMATION CENTRE, MINI COMPUTER, DATA BANK, DIESEL ENGINE CHARACTERISTICS, INFORMATION DISSEMINATION
SECTION CLASS CODES: C8580, C8520
UNIFIED CLASS CODES: ZTRAAR, ZTEAAH
LANGUAGE: GERMAN
THIS FACTORY IN THE EAST GERMAN DEMOCRATIC REPUBLIC PRODUCES DIESEL ENGINES AND OTHER HEAVY INDUSTRIAL EQUIPMENT, ALSO FOR THE PETROLEUM INDUSTRY. THE INFORMATION CENTRE AT THE WORKS USES A MINI COMPUTER FOR BUILDING UP A DATA BANK OF DIESEL ENGINE CHARACTERISTICS. VARIOUS PUBLICATIONS DISSEMINATE USEFUL INFORMATION (ON DIESEL ENGINES AND RELATED SUBJECTS) TO WIDER CIRCLES. THE CENTRE COOPERATES WITH ITS POLISH AND RUSSIAN COUNTERPARTS AND FORMS A CONSTITUENT PART OF THE STATE-CONTROLLED SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEM OF THE EAST GERMAN REPUBLIC

525758 C7313966
COLLOQUIUM DIGEST ON COMPUTER STRUCTURES FOR ARTIFICIAL INTELLIGENCE
; IEE, IERE
1973
11 MAY 1973 IEE, IERE LONDON, ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: ARTIFICIAL INTELLIGENCE, BOILERS, COMPUTER APPLICATIONS, CONTROLLERS, LEARNING SYSTEMS
IDENTIFIERS: COMPUTER STRUCTURES, ARTIFICIAL INTELLIGENCE, COMPUTATIONAL PROBLEMS, LEARNING NETS, MINERVA AND ASTRA LEARNING SYSTEMS, OBJECT MOTION SIMULATION, HUMAN CONTROLLERS, ADAPTIVE CONTROLLERS, STEAM ENGINE BOILER SYSTEM, NEURON PLASTIC CHANGE MODELS
SECTION CLASS CODES: C6440, C8890
UNIFIED CLASS CODES: VCKAAK, WMZAAP
THE FOLLOWING TOPICS WERE DEALT WITH: HUMAN AND AUTOMATIC ADAPTIVE CONTROLLERS, COMPUTATIONAL PROBLEMS, DYNAMIC DIGITAL LEARNING NETS, MINERVA AND ASTRA LEARNING SYSTEMS, ITERATIVE ARRAYS FOR OBJECT MOTION SIMULATION, MODELS OF PLASTIC CHANGE IN NEURONS, AND APPLICATIONS TO STEAM ENGINE-BOILER SYSTEM. 9 PAPERS WERE PRESENTED, OF WHICH ALL ARE PUBLISHED IN FULL IN THE PRESENT PROCEEDINGS

518935 C7312556
ELECTRONIC FUEL INJECTION SYSTEM
GORDON, C.C., MCGAVIC, J.P.
PATENT NO.: USA 3702601 ASSIGNEES: GENERAL MOTORS CORP. FILED: 11 JUNE 1971
ORIGINAL PATENT APPL. NO.: USA 152088
14 NOV. 1972
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, DIGITAL CONTROL, FLOW CONTROL
IDENTIFIERS: ELECTRONIC FUEL INJECTION SYSTEM, INTERNAL COMBUSTION ENGINE, FUEL INJECTORS, TIMING SIGNALS, SYNCHRONIZATION, MAGNITUDE PERMUTATIONS, PULSE TRAIN, CONTROL PULSES, ENGINE CYCLE
SECTION CLASS CODES: C7851, C7453
UNIFIED CLASS CODES: VMKCAD, VGEVAS

AN INTERNAL COMBUSTION ENGINE INCLUDES A GROUP OF EIGHT FUEL INJECTORS FOR APPLYING FUEL TO THE ENGINE. A SET OF FOUR TIMING SIGNALS DEVELOPED IN SYNCHRONIZATION WITH ENGINE OPERATION COLLECTIVELY CONTAIN EIGHT MAGNITUDE PERMUTATIONS PER ENGINE CYCLE. THE OCCURRENCE OF EACH OF THE MAGNITUDE PERMUTATIONS DEFINES THE START OF INJECTION FOR A CORRESPONDING ONE OF THE FUEL INJECTORS. THE SET OF TIMING SIGNALS IS COMBINED TO FORM A PAIR OF TIMING SIGNALS WHICH ARE COMBINED TO FORM A SINGLE TIMING SIGNAL CONTAINING ALL OF THE MAGNITUDE PERMUTATIONS. A SINGLE PULSE TRAIN DEVELOPED IN SYNCHRONIZATION WITH THE SINGLE TIMING SIGNAL CONTAINS EIGHT CONTROL PULSES PER ENGINE CYCLE. THE LENGTH OF EACH OF THE CONTROL PULSES DEFINES THE PERIOD OF INJECTION FOR A CORRESPONDING ONE OF THE FUEL INJECTORS IN TIME COMPRESSED NONOVERLAPPING RELATIONSHIP. THE SINGLE PULSE TRAIN IS SEPARATED BY THE SINGLE TIMING SIGNALS TO FORM A PAIR OF PULSE TRAINS WHICH ARE SEPARATED BY THE PAIR OF TIMING SIGNALS TO FORM A SET OF FOUR PULSE TRAINS COLLECTIVELY CONTAINING ALL OF THE CONTROL PULSES. THE LENGTH OF THE CONTROL PULSES IN THE SET OF PULSE TRAINS IS EXTENDED TO DEFINE THE PERIOD OF INJECTION FOR THE FUEL INJECTORS IN TIME EXPANDED OVERLAPPING RELATIONSHIP. LASTLY, THE SET OF PULSE TRAINS IS SEPARATED BY THE SET OF TIMING SIGNALS TO FORM A SERIES OF EIGHT PULSE TRAINS EACH CONTAINING CONTROL PULSES WHICH ARE APPLIED TO ENERGIZE A CORRESPONDING ONE OF THE GROUP OF EIGHT FUEL INJECTORS

509024 B73186B4, C7310722
A COMPUTER SYSTEM FOR PROCESS CONTROL AND PREDICTIVE MAINTENANCE OF A DIESEL ENGINE ON A SEAGOING VESSEL
DRAGER, K.H., LILAND, H. ; DET NORSKE VERITAS, OSLO, NORWAY
; INSTRUMENT SOC. AMERICA
STD BOOK NO.: 87664 190 9
PROCEEDINGS OF THE 27TH ANNUAL ISA CONFERENCE 502/12PP. 1972
9-12 OCT. 1972 INSTRUMENT SOC. AMERICA NEW YORK, USA
PUBL: INSTRUMENT SOC. AMERICA PITTSBURGH, PA., USA
DESCRIPTORS: MAINTENANCE ENGINEERING, INTERNAL COMBUSTION ENGINES, PROCESS CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, SHIPS
IDENTIFIERS: COMPUTER SYSTEM, PROCESS CONTROL, DIESEL ENGINE, SEAGOING VESSEL, SENSORS, RING CONDITION, COMBUSTION, OPTIMAL MAINTENANCE, COMPUTER HARDWARE, SOFTWARE SYSTEM, RELIABILITY, HEAT SYSTEMS, TRANSPORTATION, MARINE SYSTEMS
SECTION CLASS CODES: B5246, B1263, C7874, C7851, C8846
UNIFIED CLASS CODES: TEGGAE, ADGDAL, VMRKAM, VMKCAD, WMEKAS
THIS PAPER DESCRIBES A COMPUTER SYSTEM INSTALLED ONBOARD A LARGE NORWEGIAN TANKER FOR PROCESS CONTROL AND PREDICTIVE MAINTENANCE OF THE PROPULSION MACHINERY; A SULZER DIESEL ENGINE (4 REFS)

499678 B7315469, C7308672
VIRGULE VARIABLE-GEOMETRY WHEELED TELEOPERATOR
VERTUT, J., GUILBAUD, J.-P., DERRIE, G., GERMOND, J.-C., RICHE, F. ; COMM. ENERGIE ATOMIQUE, SACLAY, FRANCE
FARMAKES, R.
; AMERICAN NUCLEAR SOC
PROCEEDINGS OF THE 20TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY 203-9 1972
19-21 SEPT. 1972 AMERICAN NUCLEAR SOC IDAHO FALLS, IDAHO, USA
PUBL: AMERICAN NUCLEAR SOC. HINSDALE, ILL., USA
DESCRIPTORS: ROAD VEHICLES, TELECONTROL EQUIPMENT, DRIVES
IDENTIFIERS: TV CAMERAS, DIGITAL COMMUNICATIONS LINK, MA22 MASTER SLAVE MANIPULATORS, VARIABLE GEOMETRY WHEELED TELEOPERATOR, VIRGULE, RADIO CONTROLLED RESCUE VEHICLE, BATTERY POWERED FOR SHORT TERM OPERATIONS, PETROL ENGINE DRIVEN FOR LONG TERM OPERATIONS
SECTION CLASS CODES: B5620, C7871, C7640
UNIFIED CLASS CODES: TKEAAR, VMRCAZ, VKGAAW
VIRGULE IS A FRENCH ACRONYM REFERRING TO A RADIO-CONTROLLED RESCUE VEHICLE CAPABLE OF OPERATING OVER ROUGH TERRAIN EITHER INDOORS OR OUTDOORS. THE TELEOPERATOR IS EQUIPPED WITH AT LEAST TWO TV CAMERAS AND ONE PAIR OF MA22 MASTER-SLAVE MANIPULATORS, EACH CAPABLE OF EXERTING 12-KG FORCES IN ANY DIRECTION, AND OF LIFTING UP TO 30 KG IN CERTAIN POSITIONS. THE FOUR-WHEELED VEHICLE HAS MORE FLEXIBILITY THAN A TRACK VEHICLE. IT CAN MOVE IN A STRAIGHT LINE IN ANY DIRECTION (REFERRED TO ITS OWN AXIS) AND CAN STEER ABOUT ANY CENTER OF ROTATION, CONTROLLED BY A SINGLE CONTROL HANDLE WITH THREE DEGREES-OF-FREEDOM. WHEN THE VEHICLE IS MOVING, ONLY ONE ARM CAN BE OPERATED. A 24-CHANNEL DIGITAL COMMUNICATIONS LINK IS USED FOR CONTROL, AND ANOTHER ONE FOR FEEDBACK. THESE LINKS MAY BE RADIO OR COAXIAL CABLE. BATTERIES PROVIDE SHORT-TERM AUTONOMOUS OPERATION; POWER MAINS (INDOORS) OR A GASOLINE-ENGINE-DRIVEN GENERATOR (OUTDOORS) ARE USED FOR LONG OPERATION (8 REFS)

489569 B7311094, C7306088
DIGITAL ROTATION SPEED MEASUREMENT FOR INTERNAL-COMBUSTION ENGINES
LOSEL, M.E.
MESS. AND PRUEF. (GERMANY) VOL.8, NO.9 539-41 SEPT. 1972
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, FREQUENCY MEASUREMENT, DIGITAL CIRCUITS, ANGULAR VELOCITY MEASUREMENT
IDENTIFIERS: DIGITAL MEASUREMENT, INTERNAL COMBUSTION ENGINE, IGNITION PULSE, ROTATION SPEED MEASUREMENT, IGNITION IMPULSE FREQUENCY, IGNITION IMPULSE INTERVAL
SECTION CLASS CODES: B5246, B4455, C7455, B1870
UNIFIED CLASS CODES: TEGGAE, BKEZAK, ETNAAP
LANGUAGE: GERMAN
FOR THE DIGITAL MEASUREMENT OF THE ROTATION SPEED OF AN INTERNAL COMBUSTION ENGINE, THE IGNITION PULSE IS GENERALLY USED. TWO SOLUTIONS ARE DEALT WITH: DETERMINING THE IGNITION-IMPULSE-FREQUENCY AND DETERMINING THE IGNITION-IMPULSE-INTERVAL. BOTH SCHEMES ARE DESCRIBED

488746 B7311423, C7304089
PROCESS COMPUTER CONTROLS RETARDER AND HUMP SHUNTING ENGINE
HETZ, K.
DTSCH. EISENBAHNTECH. (GERMANY) VOL.20, NO.11 490-4 NOV. 1972
CODEN: DEBTAN
DESCRIPTORS: LOCOMOTIVES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, BRAKES, PROCESS CONTROL
IDENTIFIERS: RETARDER, HUMP SHUNTING ENGINE, EFFICIENCY, HUMP, PROCESS COMPUTER CONTROL
SECTION CLASS CODES: B5620, C7872, C8846, C8849
UNIFIED CLASS CODES: TKEAAR, VMREAK, WMPKAS, WMPZAN
LANGUAGE: GERMAN
THE EFFICIENCY OF A HUMP IS DECISIVELY DETERMINED BY THE TIMES OF LOSS AND SHUNTING SPEED. AN INSTALLATION AT THE GOODS STATION OF HALLE IS PRESENTED WHERE THE EFFICIENCY WAS INCREASED BY 5.5 PER CENT UNDER EXPERIMENTAL CONDITIONS

488701 B73111364, C73003952
MODIFICATION OF A FUEL-CELL ENGINE FOR CONTROL BY A DIGITAL COMPUTER
HAGEDORN, N.H.
REPORT NO.: NASA-TM-X-2575 ISSUED BY: NASA, CLEVELAND, OHIO, USA
JUNE 1972
DESCRIPTORS: FUEL CELLS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, ELECTRICAL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: DIGITAL COMPUTER, SOLENOID VALVES, TRANSDUCERS, LIMIT SWITCHES, LOAD, ELECTROLYTE CONCENTRATION, SYSTEM SHUTDOWN, FUEL CELL ENGINE, DIRECT ENERGY CONVERSION
SECTION CLASS CODES: B5416, C7856, C8841, C8846
UNIFIED CLASS CODES: EVCGAH, VMKKAR, WMECAE, WMEKAS
AVAILIABILITY: NTIS, SPRINGFIELD, VA. 22151, USA
A MANUALLY OPERATED FUEL-CELL SYSTEM WAS MODIFIED TO BE MONITORED AND CONTROLLED BY A DIGITAL COMPUTER. THE PURPOSE WAS TO HAVE A TEST ITEM WITH WHICH TO STUDY POSSIBLE SYSTEM-COMPUTER INTERFACE PROBLEMS. THE MODIFICATION CONSISTED OF INSTALLING SOLENOID VALVES, CIRCUITRY, TRANSDUCERS, AND LIMIT SWITCHES ON THE SYSTEM. THESE MODIFICATIONS PERMIT COMPUTER CONTROL OF LOAD CURRENT, REACTANT PURGE, WATER REMOVAL, AND ELECTROLYTE CONCENTRATION AND COMPUTER INITIATION OF SYSTEM SHUTDOWN

480219 B7307008, C7304913
WASTE GAS UTILISATION IN MARINE ENGINE INSTALLATIONS
BEHLORADSKY, H.-J.
BRENNST.-WAERME-KRAFT (BWK) (GERMANY) VOL. 24, NO. 11 411-15 NOV. 1972 CODEN: BRWKAY
DESCRIPTORS: BOILERS, STEAM PLANTS, MARINE SYSTEMS, COMPUTER-AIDED DESIGN, SHIPS
IDENTIFIERS: COMPUTER PROGRAMMES, LOAD DEPENDENT BEHAVIOUR, WASTE GAS UTILISATION, MARINE ENGINE INSTALLATIONS, OPERATIONAL EFFICIENCY, THERMAL ENERGY, STEAM TURBINE, TURBOGENERATOR, DESIGN, WASTE GAS BOILER PLANTS
SECTION CLASS CODES: B5242, C8841
UNIFIED CLASS CODES: TEGCAB, WMECAE
LANGUAGE: GERMAN
WASTE HEAT BOILER PLANTS APPEAR PARTICULARLY SUITABLE TO IMPROVE THE TOTAL OPERATIONAL EFFICIENCY. PART OF THE THERMAL ENERGY OF THE ENGINE WASTE GASES CAN BE TRANSMITTED IN A WASTE HEAT BOILER TO A WORKING MEDIUM WHICH FLOWS THROUGH A SEPARATE CYCLE, FOR INSTANCE THE STEAM TURBINE OF A TURBOGENERATOR. COMPUTER PROGRAMS FOR FULL AND PART-LOAD CONDITIONS HAVE BEEN DEVELOPED FOR THE DESIGN OF WASTE GAS BOILER PLANTS. WASTE HEAT BOILERS FOR TWO ENGINE INSTALLATIONS HAVE BEEN DESIGNED TAKING CERTAIN RESTRICTIONS INTO CONSIDERATION, AND THEIR LOAD-DEPENDENT BEHAVIOUR PREDICTED, BASED ON CALCULATED RESULTS (13 REFS)

479296 C73039lP
COMPUTER CONTROLLED ENGINE TESTING
TAYLOR, J.C. ; LONDON COLL. PRINTING, ENGLAND
; IEE, INST. MECH. ENGRS
COLLOQUIUM DIGEST ON CONTROL APPLICATIONS OF MINI-COMPUTERS
5/1-6PP. 1972
13 DEC. 1972 IEE, INST. MECH. ENGRS LONDON, ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: HEAT ENGINES, AUTOMATIC TESTING, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: COMPUTER CONTROLLED, ENGINE TESTING, TEST BEDS, SPC 16, PETROL ENGINES, DIESEL ENGINES
SECTION CLASS CODES: C7851, C8846, C8849
UNIFIED CLASS CODES: VMKCAD, WMEKAS, WMEZAN
DESCRIBES TWO ENGINE TEST BEDS THAT HAVE BEEN BUILT AND FULLY INSTRUMENTED FOR COMPUTER CONTROL. THE TWO TEST BEDS ARE CONTROLLED LOCALLY WITH ANALOGUE 3-TERM CONTROLLERS IN EACH CONTROL LOOP. THE SET-POINT INPUTS TO THE CONTROLLERS CAN BE SWITCHED SO THAT EITHER LOCAL MANUAL CONTROL OR CONTROL FROM ANALOGUE OUTPUT FROM A DIGITAL COMPUTER IS POSSIBLE. THE TWO BEDS ARE LINKED TO A GENERAL AUTOMATION SPC 16 DIGITAL COMPUTER VIA AN INTERFACE

466783 C7302327
GENERALIZED SIMULATION TECHNIQUE FOR TURBOJET ENGINE SYSTEM ANALYSIS
SELDNER, K., MIHALOEW, J.R., BLAHA, R.J.
REPORT NO.: NASA-TN-D-6610 ISSUED BY: NASA, CLEVELAND, OHIO, USA
FEB. 1972
DESCRIPTORS: HEAT ENGINES, AEROSPACE APPLICATIONS OF COMPUTERS, ANALOGUE COMPUTER METHODS, SIMULATION, COMPUTER-AIDED ANALYSIS
IDENTIFIERS: GENERALIZED SIMULATION TECHNIQUE, TURBOJET ENGINE SYSTEM ANALYSIS, PROPULSION SYSTEM DYNAMICS, CONTROLS RESEARCH, SCHEMATIC MODEL, BASIC CONSERVATION EQUATIONS, PERFORMANCE CHARACTERISTICS, NONLINEAR ANALOGUE SIMULATION, ANALOGUE COMPUTER
SECTION CLASS CODES: C8849, C9980
UNIFIED CLASS CODES: WMEZAN, XTMAAH
AVAILIABILITY: NTIS, SPRINGFIELD, VA. 22151, USA
A NONLINEAR ANALOG SIMULATION OF A TURBOJET ENGINE WAS DEVELOPED. THE PURPOSE OF THE STUDY WAS TO ESTABLISH SIMULATION TECHNIQUES APPLICABLE TO PROPULSION SYSTEM DYNAMICS AND CONTROLS RESEARCH. A SCHEMATIC MODEL WAS DERIVED FROM A PHYSICAL DESCRIPTION OF A J85-13 TURBOJET ENGINE. BASIC CONSERVATION EQUATIONS WERE APPLIED TO EACH COMPONENT ALONG WITH THEIR INDIVIDUAL PERFORMANCE CHARACTERISTICS TO DERIVE A MATHEMATICAL REPRESENTATION. THE SIMULATION WAS MECHANIZED ON AN ANALOG COMPUTER. THE SIMULATION WAS VERIFIED IN BOTH STEADY-STATE AND DYNAMIC MODES BY COMPARING ANALYTICAL RESULTS WITH EXPERIMENTAL DATA OBTAINED FROM TESTS PERFORMED AT THE LEWIS RESEARCH CENTER WITH A [illegible] ENGINE. IN ADDITION, COMPARISON WAS ALSO MADE WITH PERFORMANCE DATA OBTAINED FROM THE ENGINE MANUFACTURER. THE COMPARISONS ESTABLISHED THE VALIDITY OF THE SIMULATION TECHNIQUE

466776   B7303350, C7302320
EXPERIMENTAL VERIFICATION OF A DIGITAL COMPUTER SIMULATION METHOD FOR PREDICTING GAS TURBINE DYNAMIC BEHAVIOUR
FAWKE, A.J., SARAVANAMUTTOO, H.I.H., HOLMES, M. ; GAS COUNCIL ENGNG. RES. STATION, NEWCASTLE UPON TYNE, ENGLAND
PROC. INST. MECH. ENG. (GB) VOL.186, PT.27 323-9 1972 CODEN: PIMLAA
DESCRIPTORS: GAS TURBINES, TRANSIENT RESPONSE, SIMULATION, ENGINEERING APPLICATIONS OF COMPUTERS, MECHANICAL ENGINEERING
IDENTIFIERS: EXPERIMENTAL VERIFICATION, DIGITAL COMPUTER SIMULATION METHOD, GAS TURBINE, DYNAMIC BEHAVIOUR, MATHEMATICAL MODEL, TRANSIENT RESPONSE, TEST RESULTS, TWIN SPOOL GAS TURBINE ENGINE
SECTION CLASS CODES: B5244, C8849
UNIFIED CLASS CODES: TEGEAT, WMEZAN
A MATHEMATICAL MODEL WHICH SIMULATES THE TRANSIENT RESPONSE OF A TWIN-SPOOL GAS TURBINE ENGINE ON A GENERAL PURPOSE DIGITAL COMPUTER IS DESCRIBED TOGETHER WITH TEST RESULTS VERIFYING THE SIMULATION (5 REFS)

466770   C7302312
COMPUTER DIAGNOSIS OF THE VW
KAMINSKI, R.K.
INSTRUM. TECHNOL. (USA) VOL. 19, NO. 9 60-2 SEPT. 1972 CODEN: IRTCA4
DESCRIPTORS: SPECIAL PURPOSE COMPUTERS, VEHICLES, AUTOMATIC TEST EQUIPMENT, COMPUTER ARCHITECTURE, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SPECIAL PURPOSE COMPUTER, COMPUTER DIAGNOSIS, ENGINE, HARDWARE, TEST PROCEDURES, IGNITION PERFORMANCE, ENGINE COMPRESSION
SECTION CLASS CODES: C8849, C9840
UNIFIED CLASS CODES: WMEZAN, XREAAF
SINCE MID-1971, ALL VOLKSWAGENS HAVE BEEN EQUIPPED FOR A UNIQUE VW COMPUTER DIAGNOSIS, MORE THAN 60 SEPARATE CHECKS TO DETERMINE THE CONDITION OF A CAR HAVE BEEN MADE. EACH OF THESE VWS CONTAIN SENSORS AND WIRING WHICH ARE CONNECTED TO A SOCKET IN THE ENGINE COMPARTMENT. AT THE DEALER:S SERVICE CENTER, AN UMBILICAL CORD WILL TIE THE VW TO A SPECIAL-PURPOSE COMPUTER AND THE APPROXIMATELY 21-MINUTE CHCKOUT WILL BEGIN. SYSTEM HARDWARE AND TEST PROCEDURES ARE EXPLAINED IN THIS ARTICLE (3 REFS)

466769 B7302803, C7302311
DESIGNING DIGITAL DATA ACQUISITION SYSTEMS
WESTWICK, J.E.
INSTRUM. TECHNOL. (USA) VOL. 19, NO. 9 45-9 SEPT. 1972
CODEN: IRTCA4
DESCRIPTORS: COMPUTER GRAPHICS, DATA ACQUISITION, AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE ENGINES, AEROSPACE TEST FACILITIES, GAS TURBINES, TESTING
IDENTIFIERS: DESIGNING, DIGITAL DATA ACQUISITION SYSTEMS, COMPUTER HARDWARE, AEROSPACE, INDUSTRIAL GAS TURBINE ENGINE DEVELOPMENT, HIGH SPEED, DISPLAY, TEST ENGINEER, GRAPHIC, TABULAR FORM, REAL TIME PERFORMANCE, REAL TIME MONITOR SOFTWARE, SOLID STATE HARDWARE
SECTION CLASS CODES: C8849, C8440, B4740
UNIFIED CLASS CODES: WMEZAN, WGEAAJ, ZLGAAP
DIGITAL DATA ACQUISITION SYSTEM DEVELOPMENT AND DESIGN HAVE BECOME MORE SOPHISTICATED WITH THE AVAILABILITY OF SOLID-STATE COMPUTER HARDWARE AND REAL-TIME MONITOR SOFTWARE. A NEW SYSTEM, BASED ON DESIGN GUIDELINES REVIEWED IN THIS ARTICLE, AT GM:S DETROIT DIESEL ALLISON DIVISION SUPPORTS AEROSPACE AND INDUSTRIAL GAS TURBINE ENGINE DEVELOPMENT PROGRAMS. THE COMPUTER-BASED SYSTEM PROVIDES HIGH SPEED ACQUISITION OF DATA, DISPLAY OF REAL-TIME PERFORMANCE TO THE TEST ENGINEER AND QUICK RETURN OF FINAL PERFORMANCE RESULTS IN GRAPHIC AND TABULAR FORM

466713 C7302255
SOLUTION OF DYNAMICS OF INDIRECT CONTROL OF SHIP-PROPULSION SETS ON AN ANALOGUE COMPUTER APPLIED TO THE CKD TYPE 6L 525 II PV MARINE ENGINE
SUBRT, M.
CZECH. HEAVY IND. (CZECHOSLOVAKIA) NO.1 18-25 1972 CODEN: CZHIAK
DESCRIPTORS: STABILITY, NON-LINEAR SYSTEMS, CONTROLLERS, ANALOGUE COMPUTER METHODS, MARINE SYSTEMS, HEAT SYSTEMS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: ANALOGUE COMPUTER, MARINE ENGINE, DIESEL ENGINE, CONTROL SYSTEMS, PROPORTIONAL PLUS INTEGRAL, CONTROLLER, PROPELLER, GENERATOR, CENTRIFUGAL GOVERNOR, DISTRIBUTION GEAR WITH SLIDE VALVE, SERVOPISTON, ELASTIC FEEDBACK, DROOP, SHIP PROPULSION SETS, HARMONIC DISTURBANCES, LOAD STEP CHANGES, CONSTANT SPEED STABILISER
SECTION CLASS CODES: C8846, C9980, C6620, C6690
UNIFIED CLASS CODES: WMEKAS, XTMAAH, VEBAAW, VEVAAC
FOR RELIABLE AND SAFE OPERATION OF SHIP-PROBLEM SETS WITH DIESEL ENGINES, THE BEHAVIOUR OF THESE SETS AS CONTROL SYSTEMS MUST BE KNOWN IN ADVANCE. THE EXISTING METHODS DO NOT ENABLE THE PROPERTIES OF THESE SETS TO BE DETERMINED WITH ADEQUATE ACCURACY AND THE TESTS TO BE CARRIED OUT ON FINISHED SETS LEAVING THE FACTORY. AN ANALOGUE COMPUTER SOLUTION TO THIS NONLINEAR PROBLEM IS OFFERED. A PROPORTIONAL PLUS INTEGRAL CONTROLLER IS USED IN A SYSTEM OF DIESEL ENGINE, GEAR BOX AND PROPELLER OR GENERATOR. THE BEHAVIOUR WAS STUDIED FOR STORMY WEATHER CONDITIONS

465706 B7302810, C7301131
NERVA FLIGHT ENGINE CONTROL SYSTEM DESIGN
NORMAN, H.H., PARZIALE, E.A., SALUJA, J.K., SCHENZ, R.F., JR. : WESTINGHOUSE ELECTRIC CORP., SACRAMENTO, CALIF., USA
NUCL. TECHNOL. (USA) VOL.15, NO.3 447-54 1972 CODEN: NUTYBB
DESCRIPTORS: AEROSPACE PROPULSION, AUTOMATIC CONTROL APPLICATIONS, NUCLEAR POWER, NUCLEAR SYSTEMS, AEROSPACE CONTROL
IDENTIFIERS: NERVA FLIGHT ENGINE CONTROL SYSTEM DESIGN, NUCLEAR ROCKET ENGINE, MULTILOOP CLASSICAL CONTROLS DESIGN APPROACH, HIGH DEGREE OF COUPLING, MULTIVARIABLE NATURE, SYSTEM MODEL LINEARIZATION, SYSTEM SIMPLIFICATION, QUADRATIC OPTIMAL CONTROL DESIGN, TRANSIENT PERFORMANCE, DIGITAL IMPLEMENTATION
SECTION CLASS CODES: C7854, B4760
UNIFIED CLASS CODES: VMKGAA, ZLKAAM
MODERN CONTROL SYSTEM THEORY HAS BEEN APPLIED TO THE DESIGN OF THE CONTROL SYSTEM FOR THE NERVA NUCLEAR ROCKET ENGINE. MULTILOOP CLASSICAL CONTROLS DESIGN APPROACH HAS BEEN USED PREVIOUSLY IN THE ENGINE TEST PROGRAM. THE CONFIGURATION AND OPERATION OF THE ENGINE SYSTEM WITH THE RESULTING HIGH DEGREE OF COUPLING AND THE MULTIVARIABLE NATURE OF THE SYSTEM ESTABLISHES A NEED FOR MODERN CONTROL TECHNIQUES WITH CONSIDERABLE ADVANTAGES OVER CLASSICAL METHODS. THE DESIGN PROCEDURE CONSISTS OF SYSTEM MODEL LINEARIZATION, SYSTEM SIMPLIFICATION, AND THE QUADRATIC OPTIMAL CONTROL DESIGN. TRANSIENT PERFORMANCE RESULTS HAVE BEEN OBTAINED FROM DIGITAL IMPLEMENTATION OF THE CONTROL SYSTEM

465689 C7301114
DIGITAL CONTROL OF AN INTERNAL COMBUSTION ENGINE: THE INTERFACE DESIGN PROCESS
NICHOLS, J.A., ALLAN, J.J., III ; MCDONNELL DOUGLAS CORP., HUNTINGTON BEACH, CALIF., USA
; US DEPT. COMMERCE, IEEE
PROCEEDINGS OF THE TECHNICAL CONFERENCE :ISLANDS OF APPLICATION: 157-65 1972
8-13 JUNE 1972 US DEPT. COMMERCE, IEEE TOKYO, JAPAN
PUBL: IEEE NEW YORK, USA
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, DIGITAL CONTROL
IDENTIFIERS: DIGITAL CONTROL, INTERNAL COMBUSTION ENGINE, INTERFACE DESIGN PROCESS, POWER OUTPUT, FUEL CONSUMPTION, OPERATING TEMPERATURES, EXHAUST EMISSIONS
SECTION CLASS CODES: C7851, C8846, C8849
UNIFIED CLASS CODES: VMKCAD, WMKAS, WMZAM
A DIGITALLY CONTROLLED TEST BED FOR INTERNAL COMBUSTION ENGINES HAS BEEN BUILT AND TESTED. THE PURPOSE OF THE WORK, HOWEVER, WAS TO EXAMINE THE INTERFACE DESIGN PROCESS. THE INTERFACE DESIGN PROCESS IS DEVELOPED IN GENERIC AND THEN SPECIFIC TERMS. THE DEVELOPMENT OF THE IC ENGINE TEST BED FACILITY IS THEN DESCRIBED AS AN EXAMPLE OF THE METHOD. SPECIFIC RESULTS ARE GIVEN FOR THE PARTICULAR APPLICATION, AND THE GENERAL APPROACH IS EVALUATED (1 REFS)

465649 C7301074
THEORETICAL DESIGN OF AN ADAPTIVE CONTROLLER FOR AN I.C. ENGINE
GILL, K.F., HARLAND, G.E., SCHWARZENBACH, J.
CONTR. AND INSTRUM. (GB) VOL.4, NO.9 50-3 OCT. 1972 CODEN: CTLIAW
DESCRIPTORS: HEAT ENGINES, ANALOGUE COMPUTER METHODS, ADAPTIVE CONTROL
IDENTIFIERS: ANALOGUE COMPUTER, THEORETICAL DESIGN, ADAPTIVE CONTROLLER, INTERNAL COMBUSTION ENGINE, SPEED CONTROL
SECTION CLASS CODES: C7851, C6660, C9980, C8846
UNIFIED CLASS CODES: VMKCAD, VENAAG, XTMAAH, WMEKAS
AN I.C. ENGINE-SPEED CONTROL SYSTEM HAS BEEN INVESTIGATED THEORETICALLY ON AN ANALOGUE COMPUTER TO DETERMINE THE DEGREE OF IMPROVEMENT IN EXISTING SPEED-CONTROL SYSTEMS THAT CAN BE OBTAINED BY USING ADAPTIVE TECHNIQUES (3 REFS)

465648 C7301073
COMPUTER CONTROL FOR IC ENGINES DEVELOPMENT
BLOXHAM, R.D., JONES, T.P., MURGATROYD, W., WING, R.D.
CHART. MECH. ENG. (GB) VOL.9, NO.9 58-61 OCT. 1972 CODEN: CHMGAF
DESCRIPTORS: HEAT ENGINES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: INTERNAL COMBUSTION ENGINES, REAL TIME COMPUTING, COMPUTER CONTROL, DEVELOPMENT, OPTIMUM EQUIPMENT, PROGRAMMING, TEST FACILITY, ENVIRONMENTAL STUDIES, CYCLIC FLUCTUATIONS, PERKINS PRODUCTION DIESEL ENGINE
SECTION CLASS CODES: C7851, C8846, C8849
UNIFIED CLASS CODES: VMKCAD, WMEKAS, WMEZAN
DEVELOPMENT OF THE OPTIMUM EQUIPMENT AND PROGRAMMING NECESSARY FOR A VERSATILE COMPUTER-CONTROLLED IC ENGINES TEST FACILITY HAS BEEN CARRIED OUT IN THE MECHANICAL ENGINEERING DEPARTMENT AT IMPERICAL COLLEGE, LONDON. ENVIRONMENTAL STUDIES OF A WIDELY VARYING NATURE HAVE BEEN THE PRIMARY OBJECTIVE AND THE FACILITY HAS ENORMOUS POTENTIAL FOR GENERAL ENGINE RESEARCH PARTICULARLY IN THE DEVELOPMENT STAGES OF PRODUCTION ENGINES. THE OVERALL PERFORMANCE OF THIS PROTOTYPE ALL-DIGITAL CONTROL AND ANALYSIS SYSTEM HAS ALREADY SHOWN TIME SAVINGS OF 10:1 IN PRE-PRODUCTION TESTING FOR ONE MOTOR MANUFACTURER. THE GENERAL AIMS OF THE PROJECT ARE TWOFOLD: (I) TO DEMONSTRATE THE USE OF COMPUTERS IN ENGINE DEVELOPMENT; (II) TO PROVIDE THE BASIC FACILITIES REQUIRED FOR SOPHISTICATED EXPERIMENTS ASSOCIATED WITH ENGINES RESEARCH AND TO DEMONSTRATE THE POTENTIAL OF REAL-TIME COMPUTING IN THIS CONNECTION. THE FIRST DEMONSTRATION OF THIS KIND, RELATED TO CYCLIC FLUCTUATIONS ON A PERKINS PRODUCTION DIESEL ENGINE, IS DESCRIBED

455590 C7225377
A FLUIDIC SENSOR FOR CLOSED LOOP ENGINE ACCELERATION CONTROL
WETZEL, A.J., ARNETT, S.E., HIGH, R.
FLUID. Q. (USA) VOL.4, NO.2 68-79 APRIL 1972 CODEN: FLOUA2
DESCRIPTORS: HEAT ENGINES, ACCELERATION CONTROL, FLUIDICS, NONELECTRIC SENSING DEVICES, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: FLUIDIC SENSOR, CLOSED LOOP, ENGINE ACCELERATION CONTROL, HYBRID CONTROLLER, COMPUTER, FUEL CONTROL, TURBO GAS GENERATOR ENGINES
SECTION CLASS CODES: C7551, C7322, C7422, C8825
AN ANALYTICAL AND DEMONSTRATION PROGRAM WAS CONDUCTED TO EVALUATE THE APPLICABILITY OF A UNIQUE ACCELERATION PARAMETER FOR TURBO-GAS GENERATOR ENGINES. THIS PARAMETER IS THE ENGINE AIRFLOW GENERALIZED TO THE COMPRESSOR DISCHARGE STATION. CONTROL-ENGINE TESTS WERE CONDUCTED USING A HYBRID CONTROL SYSTEM AND A J85-GE-7 ENGINE. THE HYBRID CONTROLLER CONSISTED OF FLUIDIC AND ELECTRONIC SENSORS, THE AFAPL IBM 1800 COMPUTER AND AN ELECTROHYDROMECHANICAL FUEL CONTROL. IN THIS PAPER THE FINDINGS OF THE PROGRAM, WITH PARTICULAR EMPHASIS ON THE FEATURES OF A FLUIDIC SENSOR WHICH WAS USED TO MEASURE THE PARAMETER, AND THE CONTROL PROGRAMMING FLEXIBILITY AVAILABLE WITH THE IBM 1800 ARE DISCUSSED

447278 C7224258
REMOTE TEST SITE COMPUTATION OF COMPLEX ENGINE INLET DYNAMIC PARAMETERS USING AN ANALOG COMPUTER
SMITH, R.L., FLEETWOOD, P.M. ; MCDONNELL AIRCRAFT CO., ST. LOUIS, MO., USA
ISA TRANS. (USA) VOL.11, NO.1 56-64 1972 CODEN: ISATAZ
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, REAL TIME SYSTEMS, ANALOGUE COMPUTER METHODS, HEAT ENGINES
IDENTIFIERS: REAL TIME COMPUTATION, DISPLAY, ANALOGUE COMPUTER, REMOTE TEST SITE COMPUTATION, COMPLEX ENGINE INLET DYNAMIC PARAMETERS, DYNAMIC PRESSURE DATA SIGNALS, INTEGRATED CIRCUIT OPERATIONAL AMPLIFIERS, PRATT AND WHITNEY ENGINE PARAMETERS, HARDWARE, COMPUTATIONAL CIRCUITRY, FLAGGING PULSES, DIGITIZATION, COMPUTER ANALYSIS
SECTION CLASS CODES: C8829, C9950
A SYSTEM TO PROVIDE REAL-TIME COMPUTATION AND DISPLAY OF COMPLEX ENGINE INLET DISTORTION PARAMETERS, COMPUTED FROM A LARGE NUMBER OF DYNAMIC PRESSURE DATA SIGNALS, WAS SUCCESSFULLY IMPLEMENTED USING INTEGRATED CIRCUIT OPERATIONAL AMPLIFIERS AS THE PRIMARY ANALOGUE COMPUTATIONAL ELEMENTS. PRATT AND WHITNEY ENGINE PARAMETERS ARE SHOWN AND HARDWARE DIAGRAMS OF THE COMPUTATIONAL CIRCUITRY ARE EXPLAINED. ALSO SHOWN IS HOW THE SYSTEM PROVIDED FLAGGING PULSES TO THE RAW DATA TAPES FOR SUBSEQUENT DIGITIZATION AND COMPUTER ANALYSIS OF :WORST CASE: DATA, WITH RESULTANT IMPROVEMENT IN TEST DATA AT SIGNIFICANT SAVINGS IN TIME AND MONEY (4 REFS)

446709 C7223638
THE VIBRATION OF ENGINE CRANKSHAFTS-A FAST NUMERICAL SOLUTION
CRAVEN, A.H., HOLMES, R. ; UNIV. SUSSEX, BRIGHTON, ENGLAND
INT. J. NUMER. METH. ENG. (GB) VOL. 5, NO. 1 17-24 SEPT.-OCT. 1972 CODEN: IJNMBH
DESCRIPTORS: NUMERICAL METHODS, PHYSICS
IDENTIFIERS: VIBRATION, ENGINE CRANKSHAFTS, FAST NUMERICAL SOLUTION, DYNAMICAL EQUATIONS, MOTION, CLEARANCE TOLERANCE, BEARING, MINIMUM FILM THICKNESS, CLEARANCE TOLERANCE, COMPUTER TIME
SECTION CLASS CODES: C8240
THIS PAPER DESCRIBES A VERY FAST NUMERICAL METHOD FOR SOLVING THE FULL DYNAMICAL EQUATIONS GOVERNING THE MOTION OF THE CRANKSHAFT AND, AS AN EXAMPLE, THE METHOD IS USED TO CALCULATE THE EFFECT OF CLEARANCE TOLERANCE ON THE PERFORMANCE OF A TYPICAL BEARING. IT WAS FOUND THAT THE MINIMUM FILM THICKNESS IS NOT GREATLY AFFECTED BY THE CLEARANCE TOLERANCE, SUGGESTING THAT A FAIR DEGREE OF VARIATION OF CLEARANCE CAN BE ALLOWED (3 REFS)

436915 C7222538
TURBINE TORQUE COMPUTER
PATENT NO.: UK 1266262 ASSIGNEES: BENDIX CORP. FILED: 20 MARCH 1970
ORIGINAL PATENT APPL. NO.: USA 810668
PRIORITY DATE: 26 MAR 1969
8 MARCH 1972
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, TURBINES, TORQUE MEASUREMENT, AEROSPACE APPLICATIONS OF COMPUTERS, SPECIAL PURPOSE COMPUTERS
IDENTIFIERS: TURBINE TORQUE COMPUTER, HELICOPTERS, RESERVE CAPABILITY, STATIC PRESSURE, AMBIENT TEMPERATURE SIGNALS, ADJUSTMENT DEVICE, ENGINE CHARACTERISTICS, COMPENSATE
SECTION CLASS CODES: C9650, C8829
A TURBINE TORQUE COMPUTER IS DISCLOSED FOR HELICOPTERS. IT COMPUTES THE RESERVE CAPABILITY OF THE TURBINE BY OPERATING ON STATIC PRESSURE AND AMBIENT TEMPERATURE SIGNALS, TO PRODUCE A SIGNAL CORRESPONDING TO RATED TORQUE AT THAT PRESSURE AND TEMPERATURE. OPERATING ON THIS SIGNAL AND A SIGNAL CORRESPONDING TO THE TORQUE OUTPUT OF THE TURBINE, IT PRODUCES A SIGNAL CORRESPONDING TO PERCENTAGE MAXIMUM RATED TORQUE BEING PRODUCED BY THE ENGINE. PREFERABLY A SUBNORMAL ADJUSTMENT DEVICE IS CONNECTED BETWEEN THE TWO PARTS OF THE COMPUTER FOR ADJUSTING THE RATED TORQUE SIGNAL TO COMPENSATE FOR SUB-NORMAL ENGINE CHARACTERISTICS

436519 A7258940, C7222131

AN ANALYSIS OF EACH ENGINE CYCLE USING A DIGITAL ELECTRONIC COMPUTER

HIGASHINO, I., YOSHIMURA, K. ; OSAKA CITY UNIV., JAPAN

MEM. FAC. ENG. OSAKA CITY UNIV. (JAPAN) VOL.12 25-37 DEC. 1971

CODEN: MFEOAR

DESCRIPTORS: COMBUSTION, COMPUTER APPLICATIONS, HEAT ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, ANALOGUE-DIGITAL CONVERSION

IDENTIFIERS: A/D CONVERTORS, DIGITAL ELECTRONIC COMPUTER, DIGITAL DATA PROCESSING DEVICE, INSTANTANEOUS CHARACTERISTIC VALUES, COMBUSTION, CYLINDER PRESSURE, INTERNAL COMBUSTION ENGINE, GAS CONDITION, POWER UP, EXHAUST GAS CLEANING, CYCLE SIMULATION, ANALOGUE DATA RECORDER

SECTION CLASS CODES: A0400, C8829, A0240

THE COMBUSTION IN A CYLINDER OF AN INTERNAL COMBUSTION ENGINE IS COMPLETED IN A VERY SHORT TIME, AND ALSO VARIOUSLY INFLUENCED BY MANY FACTORS. IN VIEW OF THE FACT THAT COMBUSTION CHANGES CYCLE TO CYCLE, IT IS VERY DIFFICULT IN TECHNIQUE TO KNOW THE GAS CONDITION IN A CYLINDER DIRECTLY. BUT IT IS ESSENTIALLY NECESSARY TO ANALYZE AND ESTIMATE A COMBUSTION CONDITION CYCLE TO CYCLE IN ORDER TO SOLVE THE PROBLEM OF POWER UP OR EXHAUST GAS CLEANING. IN OTHER HAND, FOR ANALYZING A COMBUSTION CONDITION, PROCEDURE OF CYCLE SIMULATION IS USED. IN THIS CASE, IT IS NOT EASY TO ESTIMATE HEAT RELEASE RATE OF A PRE-MIXTURE ENGINE IN COMPARISON WITH A FUEL INJECTION ENGINE. IN THIS PAPER, IN ORDER TO ANALYZE AND ESTIMATE A COMBUSTION, THE PRESSURE VALUE IN A CYLINDER, WHICH CAN BE MEASURED RELATIVELY EASILY AS AN INSTANTANEOUS VALUE, IS MEASURED WITH USE OF AN ANALOGUE DATA RECORDER AND ITS DATA IS TRANSFORMED TO DIGITAL DATA BY A-D CONVERTOR. AFTER THIS PROCEDURE BY USING A DIGITAL ELECTRONIC COMPUTER AND THIS DIGITAL PRESSURE DATA, SOME CHARACTERISTIC VALUES OF COMBUSTION ARE CALCULATED AT EACH POINT OF A SMALL CRANK ANGLE INTERVAL, FOR EXAMPLE, THE POLYTROPIC EXPONENT, THE RATE OF PRESSURE INCREASE, THE RATE OF CYLINDER VOLUME CHANGE, THE GAS TEMPERATURE, THE SPECIFIC HEAT RATIO AND THE RATE OF GAS HEATING. AND THEN THE MEAN EFFECTIVE PRESSURE AND THE TOTAL HEAT RELEASE ARE CALCULATED (5 REFS)

435441 C7220939
ENGINE SPEED AND CLUTCH SYNCHRONIZING CONTROLS INCLUDING TRANSMISSION CONTROLS
NUMAZAWA, A., ITO, O.
PATENT NO.: USA 3645366 ASSIGNEES: NIPPONDENSO, K.K. FILED: 1 JUNE 1970
ORIGINAL PATENT APPL. NO.: JAPAN 44/43885
PRIORITY DATE: 3 JUN 1969
29 FEB. 1972
DESCRIPTORS: SPEED CONTROL, ROAD TRAFFIC, LOGIC CIRCUITS, DIGITAL CIRCUITS, CLUTCHES
IDENTIFIERS: ENGINE SPEED AND CLUTCH SYNCHRONIZING CONTROL, TRANSMISSION CONTROLS, ELECTRONIC CONTROL SYSTEM, GEAR SHIFTS, SYNCHRONOUS CLUTCH SHAFT SPEEDS, PRESHIFT PREDICTIVE COMPUTER, DIGITAL LOGIC CIRCUITRY
SECTION CLASS CODES: C7461, C7322
AN ELECTRONIC CONTROL SYSTEM FOR A CLUTCH LOCATED BETWEEN AN ENGINE AND A VARIABLE RATIO TRANSMISSION INCLUDES MEANS TO DETECT THE SPEED OF THE INPUT AND OUTPUT CLUTCH SHAFTS, AND TO CONTROL THE ENGINE SPEED BEFORE DURING GEAR SHIFTS SO THAT THE CLUTCH WILL ENGAGE AT SYNCHRONOUS CLUTCH SHAFT SPEEDS. A SPECIAL PRESHIFT PREDICTIVE COMPUTER MEANS IS USED IN COMBINATION WITH SPECIAL DIGITAL LOGIC CIRCUITRY TO INSURE RELIABLE AND OPTIMUM OPERATION

435322 C7220814
FLUIDIC GOVERNOR SYSTEM
PATENT NO.: UK 1266415 ASSIGNEES: BENDIX CORP. FILED: 7 MARCH 1969
ORIGINAL PATENT APPL. NO.: USA 712976
PRIORITY DATE: 14 MAR 1968
8 MARCH 1972
DESCRIPTORS: SPEED CONTROL, FLUIDICS, DIGITAL CIRCUITS, CONTROLLERS
IDENTIFIERS: FLUIDIC GOVERNOR SYSTEM, CONTROLLING, FLUID PULSE GENERATORS, TRAIN PULSES, ENGINE SPEED, FLUIDIC CIRCUITRY, FLUID PULSE ERROR SIGNAL, FREQUENCY
SECTION CLASS CODES: C7322, C7410
DISCLOSES A SYSTEM FOR CONTROLLING THE SPEED OF AN ENGINE. IT EMPLOYS FLUID PULSE GENERATORS PRODUCING PULSES, HAVING A FREQUENCY REPRESENTING THE SPEED OF THE ENGINE, AND FURTHER TRAIN PULSES FOR REPRESENTING A DESIRED ENGINE SPEED VALUE. THE PULSE TRAINS ARE FED TO FLUIDIC CIRCUITRY PRODUCING A FLUID PULSE ERROR SIGNAL HAVING A FREQUENCY WHICH VARIES WITH THE ERROR SIGNAL AND WHICH CONTROL THE ENGINE TO REDUCE THE ERROR

424526 C7219772
PRACTICAL APPLICATION OF COMPUTERS TO AUTOMOTIVE ENGINE BEARING DESIGN
SPIKES, R.H., PIRAULT, J.P.
END ENG. MATER. AND DES. (GB) VOL.15, NO.6 493-6 JUNE 1972
CODEN: EMADA3
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, COMPUTER-AIDED DESIGN
IDENTIFIERS: COMPUTERS, AUTOMOTIVE ENGINE BEARING DESIGN, LUBRICATION, HYDRODYNAMIC PERFORMANCE OF THE OIL, BIG END BEARING
SECTION CLASS CODES: C8829
DESCRIBES HOW THE COMPUTER MAY BE USED IN CALCULATIONS CONCERNING THE LUBRICATION SYSTEM AND HYDRODYNAMIC PERFORMANCE OF THE OIL IN A BIG END BEARING (7 REFS)

424278 A7248636, B7225961, C7219502
PROCEEDINGS OF THE 17TH INTERNATIONAL ISA AEROSPACE INSTRUMENTATION SYMPOSIUM
; INSTRUMENT SOC. AMERICA
STD BOOK NO.: 87664 154 0
1971
10-12 MAY 1971 INSTRUMENT SOC. AMERICA LAS VEGAS, NEV., USA
PUBL: INSTRUMENT SOC. AMERICA PITSBURGH, PA., USA
DESCRIPTORS: SPACE VEHICLES INSTRUMENTATION, COMPUTER APPLICATIONS, AEROSPACE INSTRUMENTATION, AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE
IDENTIFIERS: AEROSPACE INSTRUMENTATION, ENVIRONMENTAL INSTRUMENTATION, AEROSPACE COMPUTER APPLICATIONS, ENGINE TESTING, OPTICAL INSTRUMENTATION, WIND TUNNEL, TELEMETRY, SURFACE VEHICLE INSTRUMENTATION, DATA PROCESSING, DISPLAY, MEASUREMENT TECHNIQUES, IN FLIGHT INSTRUMENTATION
SECTION CLASS CODES: A2050, B3620, C8812
THE FOLLOWING TOPICS WERE DEALT WITH: ENVIRONMENTAL INSTRUMENTATION: AEROSPACE COMPUTER APPLICATIONS; IN-FLIGHT INSTRUMENTATION; ENGINE TESTING; OPTICAL INSTRUMENTATION; WIND TUNNEL; TELEMETRY; SURFACE VEHICLE INSTRUMENTATION; DATA PROCESSING AND DISPLAY; ADVANCES IN MEASUREMENT TECHNIQUES AND DEVICES. INDIVIDUAL PAPERS WITHIN THE SUBJECT SCOPE OF THIS JOURNAL WILL BE ABSTRACTED IN THIS OR A SUBSEQUENT ISSUE

421274 B72300095
DIGITAL DATA REDUCTION METHODS FOR AIRCRAFT ENGINE NOISE ANALYSIS
MCNEILL, H. ; RENSSELAER POLYTECH. INST. CONNECTICUT, HARTFORD, USA
SOUND AND VIBR. (USA) VOL.6, NO.4 26-9 APRIL 1972 CODEN: SOVIAJ
DESCRIPTORS: ACOUSTIC NOISE, SONIC MEASUREMENTS
IDENTIFIERS: DIGITAL DATA REDUCTION METHODS, AIRCRAFT ENGINE NOISE ANALYSIS, ANALOGUE ELECTRONIC ANALYSERS, ANALYSIS TIME, FAN NOISE SPECTRUM
SECTION CLASS CODES: B3810
DIGITAL DATA REDUCTION METHODS FOR ANALYZING AIRCRAFT ENGINE NOISE CHARACTERISTICS ARE DISCUSSED. THE APPROACH IS SUPERIOR TO THOSE EMPLOYING ANALOG ELECTRONIC ANALYZERS BECAUSE OF REDUCED ANALYSIS TIME, LOWER COST, AND IMPROVED INFORMATION EXCHANGE RESULTING FROM THE ANALYTICAL TECHNIQUE STANDARDIZATION THAT IS POSSIBLE. ANALYSIS OF A FAN NOISE SPECTRUM EXEMPLIFIES APPLICATION OF THE DIGITAL DATA REDUCTION METHOD (2 REFS)

410013 C72017153
COMPUTER AIDED DESIGN OF CONTROL AND GAS EXCHANGE IN INTERNAL COMBUSTION ENGINE IN DIALOGUE MADE WITH A VIDEO DISPLAY
PAPEZ, ST., BARTSCH, H.J.
SYRBE, M.
; INTERKAMA
STD BOOK NO.: 3 486 33571 5
INTERKAMA 5TH INTERNATIONAL CONGRESS WITH EXHIBITION FOR INSTRUMENTS AND AUTOMATION 161-7 1972
14-21 OCT 1971 INTERKAMA DUSSELDORF, GERMANY
PUBL: R. OLDENBOURG VERLAG MUNICH, GERMANY
DESCRIPTORS: COMPUTER AIDED DESIGN, HEAT ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, DISPLAY SYSTEMS, MAN-MACHINE SYSTEMS
IDENTIFIERS: FOUR STROKE ENGINE, MAN MACHINE DIALOGUE, COMPUTER AIDED DESIGN, CONTROL AND GAS EXCHANGE, INTERNAL COMBUSTION, ENGINE CONTROL, OPTIMIZATION, VIDEO DISPLAY
SECTION CLASS CODES: C8829, C7551, C8825
LANGUAGE: GERMAN
THE PUTTING INTO EFFECT OF THE DEMANDS MADE ON THE DESIGNER OF ENGINES DEPENDS ON MANY PARAMETERS. AN OPTIMUM SOLUTION CAN ONLY BE FOUND IN CONNECTION WITH EXPERIMENTS. THIS IN TURN DEMANDS TIME AND MONEY. IN ORDER TO FACILITATE FINDING THE SOLUTION, TWO PROGRAMS WERE SET UP WITH WHICH ENGINE CONTROL AND GAS EXCHANGE OF THE FOUR-STROKE ENGINE IS OPTIMIZED BY MEANS OF A VIDEO DISPLAY CONNECTED WITH THE COMPUTER. THE MAN-MACHINE DIALOGUE IS SHOWN IN DETAIL ON THE BASIS OF [illegible] (4 REFS)

409795 A7248636, B7225961, C7216905
PROCEEDINGS OF THE 17TH INTERNATIONAL ISA AEROSPACE INSTRUMENTATION SYMPOSIUM
; INSTRUMENT SOC. AMERICA
STD BOOK NO.: 87664 154 0
1971
10-12 MAY 1971 INSTRUMENT SOC. AMERICA LAS VEGAS, NEV., USA
PUBL: INSTRUMENT SOC. AMERICA PITSBURGH, PA., USA
DESCRIPTORS: SPACE VEHICLES INSTRUMENTATION, COMPUTER APPLICATIONS, AEROSPACE INSTRUMENTATION, AEROSPACE APPLICATIONS OF COMPUTERS, AEROSPACE
IDENTIFIERS: AEROSPACE INSTRUMENTATION, ENVIRONMENTAL INSTRUMENTATION, AEROSPACE COMPUTER APPLICATIONS, ENGINE TESTING, OPTICAL INSTRUMENTATION, WIND TUNNEL, TELEMETRY, SURFACE VEHICLE INSTRUMENTATION, DATA PROCESSING, DISPLAY, MEASUREMENT TECHNIQUES, IN FLIGHT INSTRUMENTATION
SECTION CLASS CODES: A2050, B3620, C8812
THE FOLLOWING TOPICS WERE DEALT WITH: ENVIRONMENTAL INSTRUMENTATION: AEROSPACE COMPUTER APPLICATIONS; IN-FLIGHT INSTRUMENTATION; ENGINE TESTING; OPTICAL INSTRUMENTATION; WIND TUNNEL; TELEMETRY; SURFACE VEHICLE INSTRUMENTATION; DATA PROCESSING AND DISPLAY; ADVANCES IN MEASUREMENT TECHNIQUES AND DEVICES. INDIVIDUAL PAPERS WITHIN THE SUBJECT SCOPE OF THIS JOURNAL WILL BE ABSTRACTED IN THIS OR A SUBSEQUENT ISSUE

396731 C7213411
AIRCRAFT JET ENGINE FUEL CONTROL
PATENT NO.: DE 1256666 ASSIGNEES: BODENSEEWERK GERATE-TECHNIK GMBH FILED: 19 MARCH 1970
ORIGINAL PATENT APPL. NO.: GERMANY P1920002.3
PRIORITY DATE: 19 APR 1969
15 DEC. 1971
DESCRIPTORS: HEAT SYSTEMS, TURBINES, FLOW CONTROL, TEMPERATURE CONTROL, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, AIRCRAFT, AEROSPACE APPLICATIONS OF COMPUTERS
IDENTIFIERS: AIRCRAFT JET ENGINE FUEL CONTROL, THROTTLE LEVER, :TRIMMING: LEVER, ADJUSTING, FUEL SUPPLY, REGULATE TURBINE GAS TEMPERATURE, COMPUTER, ENGINE OPERATING CONDITIONS, AIRCRAFT ALTITUDE DEVIATIONS
SECTION CLASS CODES: C7551, C7323, C8825, C7326
DISCLOSES A FUEL CONTROL SYSTEM UTILISING A MAIN THROTTLE LEVER, ALSO A :TRIMMING: LEVER FOR ADJUSTING THE FUEL SUPPLY TO REGULATE TURBINE GAS TEMPERATURE. THE OPTIMUM TEMPERATURE OR TRIMMING LEVER SETTING IS DETERMINED BY A COMPUTER ACCOUNTING FOR ENGINE OPERATING CONDITIONS AND AIRCRAFT ALTUTUDE DEVIATIONS FROM THE OPTIMUM, BEING INDICATED BY LAMPS, ETC

385127 C72111409
ENGINE FUEL CONTROL
PATENT NO.: UK 1258392 ASSIGNEES: ROLLS-ROYCE LTD. FILED: 23 DEC. 1968
ORIGINAL PATENT APPL. NO.: UK 59029/67
PRIORITY DATE: 29 DEC 1967
30 DEC. 1971
DESCRIPTORS: AIRCRAFT, AEROSPACE CONTROL, AEROSPACE APPLICATIONS OF COMPUTERS, CLOSED LOOP SYSTEMS, MINIMIZATION, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: ENGINE FUEL CONTROL, COMPUTER, MINIMISING, FUEL REQUIREMENT, AIRCRAFT, CLOSED LOOP SYSTEM
SECTION CLASS CODES: C7575, C8829, C8825
DESCRIBES A SYSTEM USING A COMPUTER ETC., FOR MINIMISING TOTAL FUEL REQUIREMENT OF ENGINES LOCATED TOWARDS OPPOSITE SIDES OF AN AIRCRAFT ETC. COURSE DIRECTION AND SPEED ARE MAINTAINED BY A CLOSED-LOOP SYSTEM ADAPTED FOR VARYING RESPECTIVE ENGINE FUEL SUPPLIES IN OPPOSITE SENSES TO OBTAIN MAXIMUM OVERALL EFFICIENCY ETC., AS INDICATED BY ACCELERATION OF THE AIRCRAFT, PARTICULARLY IN A CASE WHERE THE ENGINE EFFICIENCIES ARE DIFFERENT

375770 C72110355
THE CDC STAR-100 A LARGE SCALE NETWORK ORIENTED COMPUTER SYSTEM
HOLLAND, S.A., PURCELL, C.J. ; CONTROL DATA CORP., MINNEAPOLIS, MINN., USA
; IEEE
5TH ANNUAL 1971 IEEE INTERNATIONAL COMPUTER SOCIETY CONFERENCE ON HARDWARE, SOFTWARE, FIRMWARE AND TRADE-OFFS (DIGESTS) 55-6 1971
22-24 SEP 1971 IEEE BOSTON, MASS., USA
PUBL: IEEE NEW YORK, USA
DESCRIPTORS: GENERAL PURPOSE COMPUTERS
IDENTIFIERS: CDC STAR 100, NETWORK ORIENTED COMPUTER SYSTEM, COMPUTER SYSTEM, COMPUTING ENGINE, DISTRIBUTED NETWORK, ARCHITECTURAL
SECTION CLASS CODES: C9610
AN EXTREMELY LARGE AND POWERFUL COMPUTER SYSTEM HAS BEEN DEVELOPED BY CONTROL DATA CORPORATION (THE STAR-100) FOR THE USE AS A LARGE COMPUTING ENGINE AT THE CENTER OF A DISTRIBUTED NETWORK OF OTHER COMPUTING SYSTEMS. THIS PAPER OUTLINES SOME OF THE SALIENT FEATURES OF THE STAR-100 SYSTEM AS WELL AS SOME CONSIDERATIONS FOR THE USE OF THIS SYSTEM IN ITS INTENDED ENVIRONMENT

364901 C7207316
RECENT DEVELOPMENT OF SHIPBOARD SUPER-AUTOMATION
IMAMURA, H.
JAMU (JAPAN) VOL.4, NO.4 38-48 1971
DESCRIPTORS: MARINE SYSTEMS, CONTROL ENGINEERING APPLICATION OF COMPUTERS
IDENTIFIERS: GENERAL PURPOSE OFFICER OR CREW PLAN, AUTOMATIC NAVIGATION SYSTEMS, ENGINE PLANT CONTROL SYSTEM, SHIPBOARD AUTOMATION, ELECTRONIC COMPUTER
SECTION CLASS CODES: C7574, C8825
STUDIES OF SHIPBOARD AUTOMATION BEGAN IN JAPAN AHEAD OF THE REST OF THE WORLD, AND 10 YEARS AGO THE WORLD:S FIRST AUTOMATED SHIP, THE :KINKASAN MARU: WAS COMPLETED. SINCE THEN, TECHNOLOGICAL IMPROVEMENTS HAVE BEEN MADE ON SHIPBOARD AUTOMATION. THE :SEIKO MARU: THAT COULD SUCCEED IN THE DEVELOPMENT OF HIGHLY CENTRALIZED CONTROL SYSTEM OF A SHIP WAS COMPLETED IN 1970 AS THE FIRST SUPER- AUTOMATED SHIP IN THE WORLD, BY TAKING FULL ADVANTAGES OF ELECTRONIC COMPUTER ON BOARD. IT IS BELIEVED THAT THE FRUITFUL RESULTS OBTAINED FROM THE TECHNICAL INNOVATION WILL BE WIDELY REFLECTED UPON THREE OBJECTIVES I.E., THE MECHANIZATION OF HUMAN TASKS ON BOARD SHIP, THE IMPROVEMENT OF SHIP SAFETY, AND ECONOMICAL OPERATION OF SHIPBOARD WORKS WHICH UNDOUBTEDLY WILL BRING ABOUT THE PROSPERITY OF THE FUTURE SHIPPING CIRCLES

364832 C7207245
MACE APPLIED TO TWO CLOSED LOOP CONTROL DDC SYSTEMS
ST. JOHNSTON, A.D., ST. JOHNSTON, A.
INSTRUM. PRACT. (GB) VOL, 26 NO. 1 36-9 JAN. 1972 CODEN: INPAAI
DESCRIPTORS: SUPERVISORY AND EXECUTIVE PROGRAMS, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, CLOSED LOOP SYSTEMS, DIRECT DIGITAL CONTROL
IDENTIFIERS: MACE, CLOSED LOOP, DDC SYSTEMS, MASTER CONTROL EXECUTIVE, CHEMICAL PLANT, INTERNAL COMBUSTION ENGINE
SECTION CLASS CODES: C7563, C8825, C8829, C8370
DESCRIBES THE APPLICATION OF A MASTER CONTROL EXECUTIVE TO THE CONTROL SYSTEMS OF A CHEMICAL PLANT AND THAT OF AN INTERNAL COMBUSTION ENGINE TEST BED. BOTH SYSTEMS BEING D.D.C

355027 C7205722
HISTORY AND APPLICATIONS OF COMPUTERS
ALLEN, M.W.
KARBOWIAK, A.E., HUEY, R.M.
STD BOOK NO.: 0 471 45853 8
INFORMATION, COMPUTERS, MACHINES, AND MAN 51-7 1971
PUBL: WILEY LONDON, ENGLAND
DESCRIPTORS: DIGITAL COMPUTERS, ANALOGUE COMPUTERS
IDENTIFIERS: ANALOGUE AND DIGITAL COMPUTERS, SLIDE RULE, HISTORY OF COMPUTERS, ARITHOMETER, JACQUARD LOOM PUNCHED CARD SYSTEM, DIFFERENCE ENGINE, ENIAC, EDVAC, APPLICATIONS OF COMPUTERS
SECTION CLASS CODES: C8000, C8800

346618 C7204938

REQUIREMENTS FOR DIGITAL COMPUTER SIMULATION OF GAS TURBINE PROPULSION SYSTEM PERFORMANCE PHASE 1: STEADY-STATE AND TRANSIENT ENGINE PERFORMANCE SIMULATION. FINAL REPORT, 15 JUL. 1969-30 JUN. 1970

HUTCHESON, L., ARMSTRONG, W.C., COOPER, S.B.

REPORT NO.: AEDC-TR-71-24 ISSUED BY: ARO INC., ARNOLD AIR FORCE STATION, TENN., USA

USGRDR NO.: AD-720803

CONTRACT NO.: F40600-71-C-0002

MARCH 1971

DESCRIPTORS: SIMULATION, HEAT ENGINES, TURBINES, ENGINEERING APPLICATIONS OF COMPUTERS

IDENTIFIERS: STEADY STATE PERFORMANCES, OFF LINE RESULTS, ON LINE RESULTS, DIGITAL COMPUTER SIMULATION, GAS TURBINE ENGINE, TRANSIENT PERFORMANCE, CORE MEMORY SIZE, THROUGHPUT TIMES, PROGRAMS, DISPLAY REQUIREMENTS, DYNAMIC COMPRESSOR MATHEMATICAL MODELS

SECTION CLASS CODES: C9940

AVAILABILITY: NTIS, SPRINGFIELD, VA. 22151, USA

PRESENT AND NEAR-FUTURE REQUIREMENTS FOR THE ADDITION OF DIGITAL COMPUTER SIMULATION OF GAS TURBINE ENGINE STEADY-STATE AND TRANSIENT PERFORMANCE TO THE PRESENT ENGINE TEST FACILITY AND PROPULSION WIND TUNNEL FACILITY DIGITAL DATA CAPABILITY WERE DETERMINED BASED ON INFORMATION AND GUIDANCE PROVIDED BY THE AIR FORCE AERO PROPULSION LABORATORY AND VARIOUS GAS TURBINE ENGINE MANUFACTURERS. DURING PHASE I OF THIS STUDY, DIGITAL COMPUTER HIGH-SPEED CORE MEMORY SIZE AND THROUGHPUT TIMES WERE DETERMINED AND ARE PRESENTED FOR SEVERAL MODERN STEADY- STATE AND TRANSIENT MATHEMATICAL MODEL SIMULATION PROGRAMS. DISPLAY REQUIREMENTS WERE ALSO DETERMINED AND ARE PRESENTED FOR FULL UTILIZATION OF THE MATHEMATICAL MODEL RESULTS, OFF-LINE AND ON-LINE SOME PRELIMINARY RESULTS ON DYNAMIC COMPRESSOR MATHEMATICAL MODELS ARE DISCUSSED

346189 C7204504

ANALOGUE INVESTIGATION OF THE INERTIA-COUPLED FREE-PISTON ENGINE

MOORE, A. ; NAT. ENGNG. LAB., EAST KILBRIDE, GLASGOW, SCOTLAND

PROC. INST. MECH. ENG. (GB) VOL. 185, NO. 53 725-32 1970-1

CODEN: PIMLAA

DESCRIPTORS: MECHANICAL ENGINEERING, ENGINEERING APPLICATIONS OF COMPUTERS, ANALOGUE COMPUTER METHODS

IDENTIFIERS: INERTIA COUPLED FREE PISTON ENGINE, ANALOGUE INVESTIGATION, EQUATIONS OF MOTION, ENGINE OF PRACTICAL DIMENSIONS, TORQUE MULTIPLY, OVERALL MECHANICAL EFFICIENCY

SECTION CLASS CODES: C8829, C9950

AN ENGINE IS DESCRIBED IN WHICH A FREE PISTON IS LOCATED INSIDE A CYLINDER ASSEMBLY WHICH IS ALSO ALLOWED FREEDOM OF MOVEMENT IN THE AXIAL DIRECTION. POWER IS TAKEN FROM THE UNIT BY COUPLING THE PISTONS [illegible] HYDROSTATIC PUMP DIRECTLY INTO THE CYLINDER ASSEMBLY. THE EQUATIONS OF MOTION FOR THE DEVICE ARE PRESENTED IN NON-DIMENSIONAL FORM AND SOLVED WITH THE AID OF AN ANALOGUE COMPUTER. RESULTS ARE [illegible] FOR AN ENGINE OF PRACTICAL DIMENSIONS AND THE INHERENT ABILITY OF THE SYSTEM TO TORQUE MULTIPLY IS CONFIRMED. ESTIMATES OF [illegible] EFFICIENCY ARE INCLUDED

NAEC-92-139

336232 B7102663, C7201[illegible]
AUTOMATIC TEST SYSTEM FOR JET ENGINE ACCESSORIES
COWLEY, R.T. ; RCA, BURLINGTON, MASS., USA
; IEEE, REGION 6, WEMA
PAPERS PRESENTED AT THE WESTERN ELECTRONIC SHOW AND CONVENTION
21/4 6PP. 1971
24-27 AUG 1971 IEEE, REGION 6, WEMA SAN FRANCISCO, CALIF., USA
PUBL: WESTERN PERIODICALS CO. NORTH HOLLYWOOD, CALIF., USA
DESCRIPTORS: AUTOMATIC TEST EQUIPMENT, AEROSPACE TEST FACILITIES, COMPUTER APPLICATIONS, AEROSPACE APPLICATIONS OF COMPUTERS, AUTOMATIC TESTING
IDENTIFIERS: AUTOMATIC TEST SYSTEM, JET ENGINE ACCESSORIES, DESIGN, MULTISTATION HARDWARE/COMPUTER-SOFTWARE SYSTEM, CONTROL, INFORMATION PROCESSING PROBLEMS, AEROSPACE TEST FACILITIES, AEROSPACE APPLICATIONS OF COMPUTERS, REAL TIME DATA ACQUISITION, AUTOMATIC CALIBRATION, AUTOMATIC TESTING
SECTION CLASS CODES: B3610, C8829

THE DESIGN AND DEVELOPMENT OF A MULTISTATION HARDWARE/COMPUTER-SOFTWARE SYSTEM HAS BEEN UNDERTAKEN TO AUTOMATE THE CALIBRATION, TEST AND MAINTENANCE OF MECHANICAL ASSEMBLIES. THE SYSTEM ATSJEA (AUTOMATIC TEST SYSTEM FOR JET ENGINE ACCESSORIES), HAS BEEN DESIGNED AND FABRICATED USING COMMERCIAL COMPONENTS. IT WILL HANDLE A WIDE RANGE OF REAL-TIME DATA ACQUISITION, CONTROL AND INFORMATION PROCESSING PROBLEMS. THE FIRST APPLICATION IS TO CALIBRATE AND TEST JET ENGINE FUEL CONTROLS. THIS PAPER PRESENTS THE SYSTEM REQUIREMENTS AND HARDWARE/COMPUTER-SOFTWARE IMPLEMENTATION THAT WAS APPLIED TO ACHIEVE THE SYSTEM PERFORMANCE GOALS

323668 C71224250
A GRAPHICS TECHNIQUE FOR THE DESIGN OF MULTIVARIABLE SYSTEMS
FALLSIDE, F., SERAJI, H. ; UNIV. CAMBRIDGE, ENGLAND
; IEE
STD BOOK NO.: 0 85296045 X
4TH UKAC CONTROL CONVENTION ON MULTIVARIABLE CONTROL SYSTEM DESIGN AND APPLICATIONS 87-92 1971
1-3 SEP 1971 IEE MANCHESTER, ENGLAND
PUBL: IEE LONDON, ENGLAND
DESCRIPTORS: MULTIVARIABLE CONTROL SYSTEMS, COMPUTER AIDED DESIGN, TURBINES
IDENTIFIERS: MULTIVARIABLE CONTROL SYSTEMS, DESIGN BY STATE FEEDBACK , DESIGN BY OUTPUT FEEDBACK, COMPUTER AIDED DESIGN, LINEAR TIME INVARIANT MULTIVARIABLE FEEDBACK SYSTEMS, FREQUENCY DOMAIN RESULTS, GAS TURBINE ENGINE CONTROL, INTERACTIVE GRAPHICS TECHNIQUE, DESIGN, STATE OR OUTPUT FEEDBACK, INCOMPLETE STATE FEEDBACK
SECTION CLASS CODES: C8825
A NEW INTERACTIVE GRAPHICS TECHNIQUE FOR THE DESIGN OF LINEAR, TIME-INVARIANT MULTIVARIABLE FEEDBACK SYSTEMS WITH ANY NUMBER OF INPUTS, STATES AND OUTPUTS IS DESCRIBED. THE METHOD IS BASED ON A NUMBER OF RECENT FREQUENCY-DOMAIN RESULTS FOR FEEDBACK DESIGN TO ACHIEVE DESIRED CLOSED-LOOP POLE POSITIONS. THESE ARE FAIRLY GENERAL AND PRACTICAL IN THAT THEY ALLOW THE DESIGNER TO EMPLOY EITHER STATE OR OUTPUT FEEDBACK, AND COVER THE CASE OF INCOMPLETE STATE FEEDBACK WHERE NOT ALL THE STATES ARE ACCESSIBLE AND OF OUTPUT FEEDBACK WHERE THERE ARE FEWER OUTPUTS THAN STATES. IN ADDITION THE DESIGNER CAN SPECIFY THE RELATIVE TIGHTNESS OF THE FEEDBACK TO EACH INPUT AND TREAT THE CASE OF FEEDBACK TO ONLY SOME INPUTS, INCOMPLETE INPUT FEEDBACK. THE METHOD IS BASED ON A PROGRAM MVSD IN WHICH THE DESIGNER POSITIONS THE CLOSED-LOOP POLES ON THE CRT DISPLAY BY MEANS OF A LIGHT-PEN. A BRIEF DESCRIPTION IS GIVEN FIRST OF THE THEORETICAL RESULTS FOLLOWED BY A DESCRIPTION OF THE INTERACTIVE PROCEDURE AND FINALLY A DESIGN STUDY IS MADE OF A 2-INPUT, 2-POUPUT, 4TH ORDER GAS-TURBINE ENGINE CONTROL PROBLEM USING THE TECHNIQUE

322953 A7174439, B7138586, C7123514
PROCEEDINGS OF THE NATIONAL AEROSPACE ELECTRONICS CONFERENCE 1971
; IEEE, DAYTON SECTION, IEEE, AEROSPACE AND ELECTRONICS GROUP
1971
17-19 MAY 1971 IEEE, DAYTON SECTION, IEEE, AEROSPACE AND ELECTRONICS GROUP DAYTON, OHIO, USA
PUBL: IEEE NEW YORK, USA
DESCRIPTORS: SPACE RESEARCH, AERODYNAMICS, NOISE ACOUSTIC, CALCULATING APPARATUS, BIOPHYSICS, AEROSPACE, AIRCRAFT, ACOUSTIC NOISE , COMPUTER APPLICATIONS, AIRCRAFT COMMUNICATION, POWER SYSTEMS, NAVIGATION, COMPUTER ARCHITECTURE, COMMUNICATIONS SYSTEMS DATA,
IDENTIFIERS: JET ENGINE, NOISE ABATEMENT, ENVIRONMENTAL SENSORS, WAKE TURBULENCE, AVIONIC COMMUNICATIONS, RADIO, VISUAL, SATELLITE, RECONNAISSANCE, NAVIGATION, SECONDARY POWER SYSTEMS, COMPUTER SYSTEMS, TIME FREQUENCY CONCEPTS, MICROELECTRONICS, BIOCYBERNETICS
SECTION CLASS CODES: A2050, B3600, C7576, B2634
THE FOLLOWING TOPICS WERE DEALT WITH: JET ENGINE NOISE ABATEMENT, ENVIRONMENTAL SENSORS; AIRCRAFT WAKE TURBULENCE; AVIONIC COMMUNICATIONS, RADIO, VISUAL, AND SATELLITE SYSTEM; AIRBORNE RECONNAISSANCE, PHOTOGRAPHIC AND RADIOMETRIC; NAVIGATION SYSTEMS; SECONDARY POWERS SYSTEMS FOR AIRCRAFT; COMPUTER SYSTEMS; TIME FREQUENCY CONCEPTS FOR AEROSPACE UTILISATION; MICROELECTRONICS AND DEVICES; BIOCYBERNETICS. THERE WERE 90 PARTICIPANTS FROM 2 COUNTRIES 59 PAPERS WERE PRESENTED, OF WHICH 44 ARE PUBLISHED IN FULL IN THE PRESENT PROCEEDINGS, AND 4 AS ABSTRACTS ONLY. INDIVIDUAL PAPERS WITHIN THE SUBJECT SCOPE OF THIS JOURNAL WILL BE ABSTRACTED IN THIS OR A SUBSEQUENT ISSUE

322586 C7123140

DIRECT HYBRID CONTROL OF AN ENGINE USING ADAPTIVE LOGIC, ADAPTIVE PROGRAMMING AND SELF-ORGANISING STORAGE

CARTER, G.A., MAMDANI, E.H., EVANS, F.J. ; QUEEN MARY COLL., LONDON, ENGLAND

; IEE

STD BOOK NO.: 0 85296045 X

4TH UKAC CONTROL CONVENTION ON MULTIVARIABLE CONTROL SYSTEM DESIGN AND APPLICATIONS 93-7 1971

1-3 SEP 1971 IEE MANCHESTER, ENGLAND

PUBL: IEE LONDON, ENGLAND

DESCRIPTORS: HEAT ENGINES, SIMULATION, HYBRID COMPUTER METHODS, SELF ORGANIZING STORAGE, LOGIC CIRCUITS, PROGRAMMING, MULTIVARIABLE CONTROL SYSTEM

IDENTIFIERS: DIRECT HYBRID CONTROL, HYBRID COMPUTER SIMULATION, MULTIVARIABLE CONTROL SYSTEMS, SELF ORGANISING STORAGE, ADAPTIVE PROGRAMMING, SMALL GENERAL PURPOSE DIGITAL COMPUTERS, CONTROL AND SUPERVISORY ROLE, :HEURISTIC: METHODS, SMALL MODEL STEAM ENGINE, :EXTERNAL: COMPARATOR CIRCUITS, ADAPTIVE LOGIC ELEMENTS

SECTION CLASS CODES: C7551, C6120, C9950, C6240

THE MOTIVATION FOR THIS IS THE POSSIBILITY OF USING SMALL GENERAL PURPOSE DIGITAL COMPUTERS OF LOW COST IN A CONTROL AND SUPERVISORY ROLE ON ESSENTIAL PLANT. THE MAIN CONCERNS ARE (A) FLEXIBILITY OF THE PROGRAM SO THAT IT CAN BE USED WITH A WIDE VARIETY OF PLANTS, AND (B) EVENTUAL RELIABILITY AND SIMPLICITY. THIS STUDY REPRESENTS A PRELIMINARY INVESTIGATION INTO THE FEASIBILITY AND EVOLUTION OF SUCH AN APPROACH BASED ON :HEURISTIC: METHODS. THE REQUIRED FLEXIBILITY OF THE PROGRAM IMPLIES THE USE OF ADAPTIVE OR :HEURISTIC: METHODS. HOWEVER, INSTEAD OF IMPLEMENTING ANY KNOWN :LEARNING: SCHEME, THE PROGRAM IN THIS STUDY HAS BEEN EVOLVED STARTING WITH THE SIMPLEST SCHEME IN ORDER TO KEEP ITS COMPLEXITY TO A MINIMUM. SINCE RELIABILITY RATHER THAN ACCURACY IS THE MAIN CONCERN, THE SYSTEM DESCRIBED IS DESIGNED TO DEAL WITH SITUATIONS THAT ARE LIKELY TO OCCUR DURING START UP AND ARE THOSE OCCURRING DUE TO LARGE PERTURBATIONS DURING NORMAL OPERATION

322569 A7175048, B7139711, C7123123
PROCEEDINGS OF THE 1971 INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE
; SOC. AUTOMOTIVE ENGRS., AMERICAN CHEM. SOC., AMERICAN INST. AERONAUTICS AND ASTRONAUTICS, AMERICAN SOC. MECH. ENGRS., IEEE, AMERICAN INST. CHEM. ENGRS., AMERICAN NUCL. SOC., AMERICAN POWER CONFERENCE, MARINE TECHNOLOGY SOC
1971
3-5 AUG. 1971 SOC. AUTOMOTIVE ENGRS., AMERICAN CHEM. SOC., AMERICAN INST. AERONAUTICS AND ASTRONAUTICS, AMERICAN SOC. MECH. ENGRS., IEEE, AMERICAN INST. CHEM. ENGRS., AMERICAN NUCL. SOC., AMERICAN POWER CONFERENCE, MARINE TECHNOLOGY SOC BOSTON, MASS., USA
PUBL: SOC. AUTOMOTIVE ENGRS. NEW YORK, USA
DESCRIPTORS: ELECTRICITY DIRECT CONVERSION, DIRECT ENERGY CONVERSION , POWER SYSTEMS, HEAT ENGINES
IDENTIFIERS: AUTOMOTIVE, ENGINE, EMISSIONS, ELECTRIC VEHICLE, POWER, SPACE FLIGHT, ENERGY CONVERSION, MEDICAL APPLICATIONS, BIOLOGICAL, ECOLOGICAL, COMPRESSION IGNITION, RADIOISOTOPE THERMOLECTRIC GENERATORS, UNDERWATER, SYSTEMS, METEOROLOGICAL EFFECTS, NUCLEAR, BATTERY, THERMAL, POLLUTION, COMPUTER SIMULATION, STIRLING ENGINES, NOISE, FUSION, HEAT, FOSSIL FUEL
SECTION CLASS CODES: A0535, B4400, C7550, B4110
THE FOLLOWING TOPICS WERE DEALT WITH: FUTURE POWER-GENERATOR METHODS; ADVANCED AUTOMOTIVE ENGINE EMISSIONS; ELECTRIC VEHICLE SYSTEMS; POWER FOR MANNED SPACE FLIGHT; ENERGY CONVERSION SYSTEMS FOR MEDICAL APPLICATIONS; ADVANCED AUTOMOTIVE ENGINES; BIOLOGICAL AND ECOLOGICAL EFFECTS OF EMISSIONS; ADVANCES IN COMPRESSION IGNITION ENGINES; RADIOISOTOPES THERMOELECTRIC GENERATOR FOR ADVANCED MISSIONS; UNDERWATER POWER SYSTEMS; METEOROLOGICAL EFFECTS OF EMISSION; NUCLEAR POWER SYSTEMS; BATTERY DEVELOPMENTS; THERMAL POLLUTION EFFECTS; SMALL STATIONARY POWER SOURCES; CLOSED CYCLE ENGINES; POWER SYSTEMS FOR ADVANCED MISSIONS; SPACE POWER TECHNOLOGY; POWER SYSTEM COMPUTER SIMULATION; STIRLING ENGINES; NOISE POLLUTION; ADVANCES IN FUSION POWER PLANTS; HEAT ENGINE HYBRID AUTOMOTIVE POWER PLANTS; RADIOISOTOPE THERMOELECTRIC GENERATORS TEST AND FLIGHT RESULTS; ADVANCES IN FOSSIL FUEL POWER PLANTS; ADVANCED AUTOMOTIVE ENGINE TECHNOLOGY. 141 PAPERS WERE PRESENTED, OF WHICH ALL ARE PUBLISHED IN FULL IN THE PRESENT PROCEEDINGS. INDIVIDUAL PAPERS WITHIN THE SUBJECT SCOPE OF THIS JOURNAL WILL BE ABSTRACTED IN THIS OR A SUBSEQUENT ISSUE

320802 A7174988, B7138590
ACOUSTICAL ENGINEERING AT JET TEST SITE
ENVIRON. CONTROL. SAF. MANAGE. (USA) VOL. 142, NO. 1 20-1 JULY 1971
DESCRIPTORS: NOISE/ACOUSTIC, NOISE, AIRCRAFT, AEROSPACE TEST FACILITIES
IDENTIFIERS: JET PLANE ENGINE, TURBOFAN ENGINE, NOISE ATTENUATING EQUIPMENT, ACOUSTICAL ENGINEERING, COMPUTER SYSTEM, SOUND ABSORBING MATERIALS
SECTION CLASS CODES: A0340, B3610
A NEED FOR A VIBRATION FREE CONTROL AND MONITORING CENTRE IS EMPHASISED

301526 C7119937
A GENERALIZED METHOD FOR CALCULATION AND ANALYSIS OF THE ACTUAL ICE CYCLE WITH CONSTANT PRESSURE IN THE SCAVENGING AND EXHAUST CHAMBERS USING A DIGITAL COMPUTER
JANKOV, R. ; UNIV. BEOGRADU, YUGOSLAVIA
TEHNIKA (YUGOSLAVIA) VOL.26, NO.4 701-16 1971 CODEN: TEHNA7
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, NUMERICAL METHODS, HEAT SYSTEMS
IDENTIFIERS: ICE CYCLE, SCAVENGING AND EXHAUST CHAMBERS, DIGITAL COMPUTER, DIESEL ENGINES, VARIABLES PRESSURES, INTERNAL ENERGY, DISSOCIATION AND VARIABILITY OF THE SPECIFIC HEAT, GAS COMPOSITION, NUMERICAL METHOD, SCAVENGING CURVE, STATIONARY MODEL TEST, SCAVENGING PROCESS, BACK FLOW OF GASES, LAWS OF COMBUSTION, HEAT TRANSFER, LEAKAGE LOSSES AND GAS VOLUME INCREASE, DIESEL ENGINE, COMPLEX SIMILARITY LAW
SECTION CLASS CODES: C8829
LANGUAGE: CROATIAN
THE METHOD CAN BE USED FOR TWO- AND FOUR-STROKE PETROL AND DIESEL ENGINES WITH CONSTANT PRESSURE IN SCAVENGING AND EXHAUST CHAMBERS AND ALSO WITH VARIABLE PRESSURES IF THESE ARE KNOWN BY MEASUREMENT. FOR CALCULATION OF THE INTERNAL ENERGY OF THE GASES IN THE CYLINDER, THE DISSOCIATION AND VARIABILITY OF THE SPECIFIC HEAT AS A FUNCTION OF TEMPERATURE AND GAS COMPOSITION WERE TAKEN INTO ACCOUNT. A NUMERICAL METHOD USING THE SCAVENGING CURVE FROM A STATIONARY MODEL TEST WAS DEVELOPED FOR CALCULATION OF THE SCAVENGING PROCESS WITH ALLOWANCE FOR BACK FLOW OF GASES INTO THE SCAVENGING CHAMBER. THE LAWS OF COMBUSTION, HEAT TRANSFER, LEAKAGE LOSSES AND GAS VOLUME INCREASE IN THE CYLINDER DUE TO COMBUSTION IN THE CASE OF THE DIESEL ENGINE WERE ALSO TAKEN INTO ACCOUNT. ALL PARTS OF THE CYCLE ARE DESCRIBED BY THE SAME SYSTEM OF EQUATIONS WHICH ARE TRANSFORMED TO PERMIT APPLICATION OF A COMPLEX SIMILARITY LAW (21 REFS)

301491 C7119902
ON LINE FOR QUICK THINKING
ASHTON, S.
ENGINEER SUPPL. (GB) 22-4 30 JUNE 1971 CODEN: ESRSB6
DESCRIPTORS: PROCESS CONTROL, TABLE-TOP COMPUTERS, ON-LINE OPERATION
IDENTIFIERS: CONTROL SYSTEMS, PROCESS CONTROL, MINI COMPUTER, FLEXIBILITY, SOFTWARE, DATA LOGGING, ENGINE TESTING, PROCESS PLANT MONITORING, GEARBOX TESTING, AXLE TESTING, MECHANICAL HANDLING
SECTION CLASS CODES: C8825
SMALL COMPUTERS HAVE OPENED THE WAY TO ON-LINE CONTROL OF MANY PROCESSES ON THE SHOP FLOOR. THIS PAPER LOOKS AT THE LIKELY APPLICATIONS

300794 C7119173
THE USES OF A REAL TIME COMPUTER IN NUCLEAR ROCKET ENGINE TESTING
HENSHALL, J.B. ; UNIV. CALIFORNIA, LOS ALAMOS, USA
; AKASHI SEISAKUSHO LTD., ET AL
PROCEEDINGS OF THE 8TH INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE 121-30 1969
25-30 AUG 1970 AKASHI SEISAKUSHO LTD., ET AL TOKYO, JAPAN
PUBL: AGNE PUBLISHING INC. TOKYO, JAPAN
DESCRIPTORS: NUCLEAR SYSTEMS, AEROSPACE CONTROL
IDENTIFIERS: REAL TIME COMPUTER, NUCLEAR ROCKET ENGINE TESTING, PROPULSIONS SYSTEM, NUCLEAR ENERGY
SECTION CLASS CODES: C7575
A PROGRAM TO DEVELOP A PROPULSION SYSTEM UTILIZING NUCLEAR ENERGY HAS BEEN UNDERWAY FOR TEN YEARS IN THE UNITED STATES. THE PROPULSION UNIT CONSISTS OF A SOLID REACTOR WITH THE NUCLEAR ENERGY TRANSFERRED TO HYDROGEN PROPELLANT. THE LOW MOLECULAR WEIGHT OF HYDROGEN GIVES A SPECIFIC IMPULSE EXCEEDING 800 SEC. IN THE TESTING PROGRAM, THE REACTOR IS OPERATED AT TEMPERATURES AND POWER DENSITIES WHICH ARE CLOSE TO MATERIAL LIMITS. THEREFORE IT BECOMES NECESSARY TO MONITOR, DURING THE TEST, REACTOR AND FACILITY PERFORMANCE. THESE MONITORING FUNCTIONS AND OTHER APPLICATIONS HAVE BEEN SOLVED BY THE USE OF A REAL TIME DIGITAL COMPUTER. IN ADDITION, THE COMPUTER GENERATES THE TIME PROFILES REQUIRED TO START THE REACTOR AND RELATED FACILITY SYSTEMS AND CONTROL THEIR OPERATION DURING THE POWERED PHASE OF THE TEST. FUTURE CONTROL USES CONTEMPLATED FOR THE COMPUTER ARE DISCUSSED

300763 C7119141
COMPUTER CONTROL OF MARINE ENGINES (PROPULSION)
SWITZMAN, J.
; SOC. ELECTRONIC AND RADIO TECHNICIANS
PROCEEDINGS OF THE SYMPOSIUM ON MARINE ELECTRONICS 109-17 1971
9-12 JUL 1971 SOC. ELECTRONIC AND RADIO TECHNICIANS BRISTOL, ENGLAND
PUBL: SOC. ELECTRONIC AND RADIO TECHNICIANS LONDON, ENGLAND
DESCRIPTORS: MARINE SYSTEMS, TRANSPORTATION, CONTROL ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: MARINE PROPULSION ENGINES, COMPUTER CONTROL, UNATTENDED ENGINE ROOM OPERATION, EFFECT OF FAILURES, INCREASED RESPONSIBILITY
SECTION CLASS CODES: C7574, C8825
WORLD WIDE GROWTH OF TRADE AND SHIPPING, TECHNICAL DEVELOPMENTS, SHORTAGE OF SKILLED MANPOWER HAVE LED TO INCREASING INTRODUCTION OF UNATTENDED ENGINE ROOM OPERATION AT SEA AND THE PARALLEL INTRODUCTION OF AUTOMATION TO MAKE THIS POSSIBLE. AT THE SAME TIME THE EFFECT OF FAILURES OF MACHINE OR MAN ARE MUCH MORE SERIOUS IN ALL ASPECTS. REDUCTION IN ENGINE ROOM CREW, LARGER AND MORE COMPLEX MACHINERY, NON-CONTINUOUS ATTENDANCE IN THE ENGINE ROOM PLACE AN EVEN BIGGER RESPONSIBILITY ON THE SHIP:S CREW

290983 C7117423

A HYBRID COMPUTER ANALYSIS OF A NON-STATIONARY PROCESS

BEAUCHAMP, K.G., THOMASSON, P.G., WILLIAMSON, M.E. ; CRANFIELD INST. TECHNOL., ENGLAND
GLADWELL, G.M.L.
; UNIV. WATERLOO

PROCEEDINGS OF THE SYMPOSIUM ON COMPUTER-AIDED ENGINEERING 19-30 1971
11-13 MAY 1971 UNIV. WATERLOO WATERLOO, ONTARIO, CANADA
PUBL: UNIV. WATERLOO WATERLOO, ONTARIO, CANADA
DESCRIPTORS: HYBRID COMPUTER METHODS, AEROSPACE APPLICATIONS OF COMPUTERS, TIME-VARYING SYSTEMS, ACOUSTIC NOISE, HEAT SYSTEMS
IDENTIFIERS: HYBRID COMPUTER ANALYSIS, NONSTATIONARY PROCESS, JET ENGINE NOISE, SPECTRAL ANALYSIS, AIRCRAFT NOISE ABATEMENT
SECTION CLASS CODES: C8829, C9950

THE PROBLEM OF JET AIRCRAFT NOISE IS AN INCREASING ONE AND THE DESIGN ENGINEER WILL SOON BE FACED WITH THE TASK OF LIMITING THIS TO THE MANDATORY LEGAL REGUIREMENTS GOVERNING THE NOISE RADIATED FROM THE AIRCRAFT IN FLIGHT. A NECESSARY PREQUISITE IS TO UNDERSTAND MORE ABOUT THE NATURE OF THIS NOISE. IT IS RELATIVELY EASY TO TAKE SOUND MEASUREMENTS FROM AN AIRCRAFT SITUATED ON THE GROUND, BUT SIMILAR MEASUREMENTS TAKEN AT GROUND LEVEL FOR AN AIRCRAFT IN FLIGHT PRESENT A NUMBER OF DIFFICULTIES DUE TO THE COMPLEX NON-STATIONARY NATURE OF THE RADIATED NOISE. THIS PAPER ATTEMPTS TO DESCRIBE A SPECTRAL ANALYSIS METHOD BY WHICH THE ENGINEER CAN BE GIVEN A QUANTITATIVE DESCRIPTION OF DETECTED NOISE VALUES SO AS TO ENABLE AN ASSESSMENT TO BE MADE OF THE EFFECTIVENESS OF HIS PRACTICAL MEASURES IN AIRCRAFT NOISE ABATEMENT

290849 C7117280
REMOTE TEST SITE COMPUTATION OF COMPLEX ENGINE INLET DYNAMIC PARAMETERS USING AN ANALOG COMPUTER
SMITH, R.L., FLEETWOOD, P.M. : MCDONNELL AIRCRAFT CO., ST. LOUIS, MO., USA
: INSTRUMENT SOC. AMERICA
STD BOOK NO.: 87664 141 9
ADVANCES IN INSTRUMENTATION, PROCEEDINGS OF THE 25TH ANNUAL ISA CONFERENCE 647/1-9 1970
II 26-29 OCT 1970 INSTRUMENT SOC. AMERICA PHILADELPHIA, PA., USA
PUBL: INSTRUMENT SOC. AMERICA PITTSBURGH, PA., USA
DESCRIPTORS: AIRCRAFT
IDENTIFIERS: REMOTE TEST SITE COMPUTATION, ANALOG COMPUTER, COMPLEX ENGINE INLET DYNAMIC PARAMETERS, INTEGRATED CIRCUIT OPERATIONAL AMPLIFIERS
SECTION CLASS CODES: C8821
A SYSTEM TO PROVIDE REAL TIME COMPUTATION AND DISPLAY OF COMPLEX ENGINE INLET DISTORTION PARAMETERS WHICH ARE COMPUTED FROM A LARGE NUMBER OF DYNAMIC PRESSURE DATA SIGNALS, WAS SUCCESSFULLY IMPLEMENTED, USING INTEGRATED CIRCUIT OPERATIONAL AMPLIFIERS AS THE PRIMARY ANALOG COMPUTATIONAL ELEMENTS. PRATT AND WHITNEY ENGINE PARAMETERS IN USE AT THE TIME ARE SHOWN AND HARDWARE DIAGRAMS OF THE COMPUTATIONAL CIRCUITRY ARE EXPLAINED. IT IS SHOWN HOW THE SYSTEM PROVIDED FLAGGING PULSES TO THE RAW DATA TAPES FOR SUBSEQUENT DIGITIZATION AND COMPUTER ANALYSIS OF :WORST CASE: DATA, WITH RESULTANT IMPROVEMENT IN TEST DATA AT SIGNIFICANT SAVINGS IN TIME AND MONEY

290156 C7116550
THE HOEGH PROJECT: OPERATIONAL CONTROL AND AUTOMATION ABOARD SHIP BY COMPUTER
DRAGER, K.H. ; DET NORSKE VERITAS, OSLO, NORWAY
; NORWEGIAN ASSOC. PROFESSIONAL ENGRS., POLYTECH. ASSOC. NORWEGIAN ASSOC. PROFESSIONAL ENGRS., IEEE, NORWEGIAN SECTION, NORWEGIAN ASSOC. ELECTRIC. ENGRS
ELEKTROTEK. TIDSSKR. (NORWAY) VOL.84, NO.8 54 6 MAY 1971
CODEN: ETTOAA
CONF: 24TH MEETING OF RADIOTECHNOLOGY AND ELECTRO-ACOUSTICS (ABSTRACTS ONLY RECEIVED) 18-20 JUN 1971 NORWEGIAN ASSOC. PROFESSIONAL ENGRS., POLYTECH. ASSOC. NORWEGIAN ASSOC. PROFESSIONAL ENGRS., IEEE, NORWEGIAN SECTION, NORWEGIAN ASSOC. ELECTRIC. ENGRS BODO, NORWAY
DESCRIPTORS: MARINE SYSTEMS, ENGINEERING APPLICATIONS OF COMPUTERS, HEAT ENGINES, PRESSURE AND VACUUM MEASUREMENT, TEMPERATURE MEASUREMENT , CONTROL ENGINEERING APPLICATIONS OF COMPUTERS, COMPUTER-AIDED ANALYSIS
IDENTIFIERS: DIESEL ENGINE INFORMATION, PRESSURE MEASUREMENT, TEMPERATURE MEASUREMENT, ENGINE CYLINDERS, COMPUTER INSTALLATION, AUTOMATIC CONTROL, SHIP:S ENGINE ROOM, CRT DISPLAY, FAULT FINDING ROUTINES, COMBUSTION
SECTION CLASS CODES: C7574, C8825, C8829
LANGUAGE: NORWEGIAN
A COMPUTER INSTALLATION USED FOR THE AUTOMATIC CONTROL OF A SHIP:S ENGINE ROOM IS DESCRIBED. TWO MACHINES ARE USED, ONE FOR PERFORMING REAL TIME TASKS, AND THE OTHER FOR DOING BATCH PROCESSING JOBS INITIATED BY EITHER THE FIRST MACHINE OR BY THE OPERATOR. INFORMATION ABOUT THE DIESEL ENGINES IS GIVEN ON A CRT DISPLAY AND FAULT FINDING ROUTINES CAN BE USED. IN PARTICULAR, THE PRESSURE AND TEMPERATURE IN THE ENGINES CYLINDERS DURING COMBUSTION CAN BE MEASURED. THE INSTALLATION IS ARRANGED TO BE EASILY ACCESSIBLE, AND HAS SELF CHECKING FACILITIES. ALL THE CONTROLS AND DISPLAYS ARE ON THE ENGINE ROOM CONTROL DESK, SO THAT CENTRAL COMMAND OF THE ENGINE ROOM IS OBTAINED

289851 C7116222
DIGITAL ENGINE CONTROL
AVIAT. REV. (GB) NO.26 16-17 MAY 1971
DESCRIPTORS: AEROSPACE INSTRUMENTATION, AEROSPACE CONTROL, TURBINES
IDENTIFIERS: ENGINE CONTROL EQUIPMENT, DIGITAL
SECTION CLASS CODES: C7551

289766 C7116131
CZECH PNEUMATIC LOGIC SYSTEM
FLUID POWER INT. (GB) VOL. 36, NO. 422 43-5, 8 MAY 1971
CODEN: FLPIAT
DESCRIPTORS: PNEUMATIC EQUIPMENT, LOGIC DEVICES
IDENTIFIERS: PNEUMATIC LOGIC SYSTEM, PNEULOG, CZECHOSLOVAKIA, MARINE ENGINE CONTROL, SWITCHES, ANALOGUE DIGITAL SIGNAL CONVERTERS, TRANSDUCERS, PROGRAMMING DEVICES, ELECTROPNEUMATIC CONVERTERS
SECTION CLASS CODES: C7461, C9240
PNEUMATIC LOGIC SYSTEMS EMPLOYING MOVING PART ELEMENTS ARE USED FAIRLY WIDELY IN EUROPE. THIS ARTICLE DESCRIBES TWO RECENT APPLICATIONS OF THE PNEULOG SYSTEM DEVELOPED IN CZECHOSLOVAKIA

264830 B7120531, C7112548
ACCELERATION PERFORMANCE ANALYSIS OF A GAS TURBINE DESTROYER ESCORT
BODNARUK, A., RUBIS, C.J. ; NAVAL SHIP RES. AND DEV. LAB., ANNAPOLIS, MD., USA
TRANS. ASME SER. A (USA) VOL.93, NO.1 49-56 JUNE 1971 CODEN: JEPOA8
DESCRIPTORS: GAS TURBINES, COMPUTER APPLICATIONS, ACCELERATION MEASUREMENT, ENGINEERING APPLICATIONS OF COMPUTERS, TURBINES, COMPUTER-AIDED ANALYSIS
IDENTIFIERS: DYNAMIC ACCELERATION PERFORMANCE ANALYSIS, GAS TURBINE ENGINE, SINGLE SCREW DESTROYER ESCORT, REVERSING REDUCTION GEAR, DIGITAL COMPUTER ANALYSIS, PROPELLER THRUST, TORQUE COEFFICIENTS, SHIP PROPULSION, PROPULSION PLANT PARAMETERS, FUEL SCHEDULED ACCELERATION, BASE PLUS BOOST OPERATING MODES, FUEL FLOW RATE CONTROL, FUEL RAMPS, TIME BASES, ENGINE OVERTORQUE CONDITIONS, TRANSIENT THRUST
SECTION CLASS CODES: B4240, C8829
THE DYNAMIC ACCELERATION PERFORMANCE OF A SINGLE SCREW DESTROYER ESCORT DRIVEN BY TWO FT4A-2 GAS TURBINE ENGINES THROUGH A REVERSING REDUCTION GEAR WAS ANALYSED. THE ANALYSIS WAS CARRIED OUT ON A DIGITAL COMPUTER USING A NEW METHOD OF A SECOND MODIFIED ADVANCE COEFFICIENT TO REPRESENT PROPELLER THRUST AND TORQUE COEFFICIENTS. QUANTITATIVE RESULTS FOR ALL THE MAJOR SHIP AND PROPULSION PLANT PARAMETERS ARE GIVEN FOR THE SHIP IN A CALM SEA WITH NO TURNING MOTIONS DURING FUEL SCHEDULED ACCELERATION IN THE BASE AND BASE-PLUS-BOOST OPERATING MODES. CONTROL OF FUEL FLOW RATES USING FUEL RAMPS WITH VARYING TIME BASES WAS FOUND TO BE EFFECTIVE IN LIMITING ENGINE OVERTORQUE CONDITIONS DURING ACCELERATION. OTHER CONCLUSIONS ON TRANSIENT THRUST, ACCELERATION TIME, AND HEAD REACH ARE ALSO PRESENTED

264820 C7112538
METHOD FOR IGNITION SYSTEM TESTING AND SERVICING DECISIONS
BRINEY, L.S., KAHEN, H., LEVITRE, P.J., LINVILLE, T.P., PETERSEN, F.G., SKARSHINSKI, L., WIDMER, A.X.
IBM TECH. DISCLOSURE BULL. (USA) VOL.13, NO.10 3185-8 MARCH 1971 CODEN: IBMTAA
DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, COMPUTER AIDED ANALYSIS
IDENTIFIERS: COMPUTER CONTROLLED AUTOMOBILE DIAGNOSTIC SYSTEM, IGNITION SYSTEM TESTING TECHNIQUES, SERVICING DECISION, SPARK PLUGS DIAGNOSIS, DISTRIBUTOR CAP, ROTOR, INTERNAL COMBUSTION ENGINE TESTING, HIGH VOLTAGE PULSE GENERATION, IGNITION SECONDARY COILS, ANALOGUE CIRCUITRY, SPARK PLUG WIRES VOLTAGE DETECTION, SPARK PLUG DISCHARGES, SPARK PLUG FIRING POTENTIALS, SPARK LINE LENGTH AND SLOPE, DATA SAMPLES COLLECTION
SECTION CLASS CODES: C8829
DESCRIBES A METHOD FOR DIAGNOSIS OF THE SPARK PLUGS, SPARK PLUG WIRES, AND DISTRIBUTOR CAP AND ROTOR OF AN INTERNAL COMBUSTION ENGINE WITHOUT DISASSEMBLY OR REMOVAL OF COMPONENT PARTS. THE METHOD CAN BE IMPLEMENTED WITH A COMPUTER CONTROLLED AUTOMOBILE DIAGNOSTIC SYSTEM. A SPECIAL APPARATUS PRODUCES A CONTROLLED HIGH-VOLTAGE PULSE, SIMILAR TO THE USUAL PULSE FROM THE IGNITION COIL SECONDARY, WHICH IS FED TO THE DISTRIBUTOR. THE SPECIAL APPARATUS ALSO CONTAINS DETECTORS AND OTHER ANALOGUE CIRCUITRY USED TO DETECT VOLTAGE ON THE SPARK PLUG WIRES AND THE END OF EACH SPARK PLUG DISCHARGE. A COMPUTER COLLECTS DATA SAMPLES AND COMPUTES SPARK PLUG FIRING POTENTIAL, SPARK LINE LENGTH, AND SPARK LINE SLOPE

246985 C7109087
COMPUTER GRAPHICS APPLICATIONS
GANDERTON, R.A.
COMPUT. AIDED DES. (GB) VOL.2, NO.3 49-60 1970 CODEN: CAIDA5
DESCRIPTORS: COMPUTER GRAPHICS, ENGINEERING APPLICATIONS OF COMPUTERS, COMPUTER-AIDED DESIGN, REVIEWS
IDENTIFIERS: COMPUTER GRAPHICS APPLICATIONS, HARD COPY GRAPHICS, INTERACTIVE GRAPHICS, DIESEL ENGINE PISTON DESIGN, CONCRETE COLUMN DESIGN, BRIDGE DESIGN, RACING ROWING BOATS, MULTISPINDLE DRILLING MACHINES, PIERCE AND BLANK TOOLS, CONTROL SYSTEMS, INTEGRATED CIRCUIT DESIGN, INFORMATION DISPLAY, PRINTED CIRCUIT BOARD LAYOUT
SECTION CLASS CODES: C8820
CONSIDERS SOME OF THE COMMERCIAL APPLICATIONS OF COMPUTER GRAPHICS. THERE ARE BASICALLY TWO FORMS GRAPHICS CAN TAKE-HARDCOPY GRAPHICS, I.E. PLOTTERS AND DRAUGHTING MACHINES, AND C.R.T. DISPLAYS. THE FIRST TYPE IS NOT TRULY INTERACTIVE, AND IS USED PRIMARILY TO OBTAIN HARDCOPY OUTPUT TO THE PROBLEM INVOLVED. THE SECOND TYPE MAY OR MAY NOT BE INTERACTIVE, AND THE LATTER CASE IS USED TO EASE OR SPEED UP THE MAN-MACHINE INTERFACE AS WELL AS OBTAIN A VISUAL OUTPUT. THE APPLICATIONS ARE GROUPED INTO HARDCOPY AND INTERACTIVE C.R.T. GRAPHICS. THE LIST IS BY NO MEANS EXHAUSTIVE OF THE WORK CURRENTLY BEING CARRIED OUT IN THE UK AND DOES NOT INCLUDE APPLICATIONS FROM OUTSIDE THE UK

244153 B7114494
NUCLEAR ROCKET EXPERIMENTAL ENGINE TEST RESULTS
DURKEE, W.E., DAMERVAL, F.R. : AEROJET NUCLEAR SYSTEMS CO., SACRAMENTO, CALIF., USA
J. SPACECR. AND ROCKETS (USA) VOL.7, NO.12 1397-402 DEC. 1970
DESCRIPTORS: AEROSPACE PROPULSION, NUCLEAR POWER
IDENTIFIERS: NUCLEAR ROCKET EXPERIMENTAL ENGINE TEST RESULTS, XE-PRIME, COMPUTER SIMULATION, AUTOMATIC TEMPERATURE STARTUPS, HIGH SPECIFIC IMPULSE OPERATION, FULL POWER, PERFORMANCE, THROTTLED PRESSURE
SECTION CLASS CODES: B4620
AN EXTENSIVE SERIES OF TESTS OF A NUCLEAR ROCKET EXPERIMENTAL ENGINE, XE-PRIME, WAS COMPLETED IN 1969. THE MAIN EMPHASIS OF THE SERIES WAS UPON CHARACTERISTICS OF STARTING FROM VARIOUS CONDITIONS AND UPON OPERATION OF THE TEST FACILITY UNDER NUCLEAR FIRING CONDITIONS; HOWEVER, ENGINE PERFORMANCE AT FULL POWER AND THROTTLED PRESSURE WERE ALSO INVESTIGATED. THIS PAPER COMPARES SELECTED STARTUP TEST RESULTS WITH PREDICTIONS MADE BY COMPUTER SIMULATION OF THE TEST SYSTEM, AND IT BRIEFLY DESCRIBES FULL-POWER AND HIGH-SPECIFIC-IMPULSE OPERATION. REPRESENTATIVE STARTUP DATA ARE PRESENTED FOR AUTOMATIC TEMPERATURE STARTUPS PERFORMED WITH INITIAL LEVELS OF 0.1 W AND 2.7 MW, INITIAL CORE TEMPERATURES OF APPROXIMATELY 250 DEGREES AND 1250 DEGREESR, AND DRUM EXPONENTIAL SET POINTS OF +11 DEGREES AND -8.5 DEGREES FROM CRITICAL. THE TEST RESULTS SHOWED THAT STARTUP CAN BE CONTROLLED OVER A WIDE RANGE OF INITIAL CONDITIONS

240555 C7107853
FLIGHT TEST EVALUATION OF AN ADVANCED ON-BOARD JET ENGINE MONITORING SYSTEM
ESSER, J.R. ; EMERSON ELECTRIC CO., ST. LOUIS, MO., USA
; IEEE, AEROSPACE AND ELECTRONIC SYSTEMS GROUP
RECORD OF THE SYMPOSIUM ON AUTOMATIC SUPPORT SYSTEMS FOR ADVANCED MAINTAINABILITY 58-69 1970
19-21 OCT 1970 IEEE, AEROSPACE AND ELECTRONIC SYSTEMS GROUP ST. LOUIS, MO., USA
PUBL: IEEE NEW YORK, USA
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, REAL-TIME SYSTEMS, AIRCRAFT, AUTOMATIC TESTING
IDENTIFIERS: FLIGHT TEST EVALUATION, JET ENGINE MONITORING SYSTEM, REAL-TIME SYSTEM, INFLIGHT REAL-TIME JET ENGINE HEALTH ANALYSIS, COMPUTER CONTROLLED JET ENGINE MONITORING SYSTEM
SECTION CLASS CODES: C8829
EMERSON ELECTRIC CO. DESIGNED, DEVELOPED AND FLIGHT TESTED ON-BOARD A PAN AMERICAN WORLD AIRWAYS B707-321B AIRCRAFT AN ENGINE PERFORMANCE MONITORING SYSTEM (EPMS). EPMS PROVIDES A MEANS OF DETERMINING THE HEALTH OF THE OPERATING JET ENGINE ON A PROVEN TECHNICAL BASIS RATHER THAN BY PERIODIC INSPECTION BASED ON ENGINE OPERATING TIME (TIME COMPLIANCE). THE SYSTEM IS DESIGNED TO AUTOMATICALLY MONITOR AND ANALYZE IN REAL TIME THE ENGINE PARAMETERS THAT ARE SENSITIVE INDICATORS OF JET ENGINE HEALTH. ENGINE ANOMALIES CAN BE DETECTED (AND ENGINE MAINTENANCE SCHEDULED), TEN TO TWENTY-FOUR HOURS SOONER THAN SYSTEMS UTILIZING ON-BOARD RECORDING AND GROUND PROCESSING (13 REFS)

240182 C7107455

COMPUTER MODELING OF ROCKET ENGINE IGNITION TRANSIENTS

MILLS, T.R., BREEN, B.P.

REPORT NO.: NASA-CR-109865 ISSUED BY: DYNAMIC SCI., IRVINE, CALIF., USA

CONTRACT NO.: NAS7-467

MAY 1970

DESCRIPTORS: MODELLING, PROGRAMMING, SPACE VEHICLES

IDENTIFIERS: COMPUTER MODELLING, ROCKET ENGINE IGNITION TRANSIENTS, PROGRAMMING, SPACE VEHICLES, TRANSIENT PROPELLANT FLOW, PRESSURE/TEMPERATURE HISTORIES, ANALYTICAL TESTS, IGNITION SPIKING, FUEL LEADS, CONTROLLED VALVE OPENING SEQUENCES, DIGITAL COMPUTER, CHAMBER PRESSURIZATION PROGRAM, STARTING CHARACTERISTICS, MAXIMUM PRESSURE PREDICTION, FUEL/OXIDIZER MIXTURE ENVIRONMENT

SECTION CLASS CODES: C8340, C6120

AVAILIABILITY: CFSTI, SPRINGFIELD, VA. 22151, USA

A COMPUTER PROGRAM WAS WRITTEN TO DESCRIBE TRANSIENT PROPELLANT FLOW AND THE PRESSURE/TEMPERATURE AND O/F HISTORIES WITH THE CHAMBER PRIOR TO IGNITION. EXPERIMENTAL TESTS WERE PERFORMED WHICH CONFIRMED THE ANALYTICAL FINDINGS. IGNITION SPIKING OCCURRED WITH FUEL LEADS AT LOW FUEL TEMPERATURE, AND EVEN AT HIGH FUEL TEMPERATURES WITH LONG VACUUM LEADS; WHILE SPIKING WAS REDUCED BY CONTROLLED VALVE OPENING SEQUENCES AT NOMINAL TEMPERATURES. THE ANALYTICAL STUDY RESULTED IN A PROPELLANT TRANSIENT FLOW DIGITAL COMPUTER PROGRAM AND A CHAMBER PRESSURIZATION TRANSIENT DIGITAL COMPUTER PROGRAM WHICH WAS USED TO OBTAIN THE ENGINE STARTING CHARACTERISTICS. THE DATA FROM THE PRESSURIZATION PROGRAM IS USED TO PREDICT MAXIMUM PRESSURES POSSIBLE FROM THE TRANSIENT CHAMBER FUEL/OXIDIZER MIXTURE ENVIRONMENT

239401 C7106650

TURBOPROP FUEL CONTROL FOR USE WITH CONTAMINATED OR VARIED FUELS

FREDLAKE, J.J., KECK, M.F., SCHWENT, G.V.

PATENT NO.: USA 3514949 ASSIGNEES: US NAVY FILED: 18 JUNE 1968

ORIGINAL PATENT APPL. NO.: USA 737958

2 JUNE 1970

DESCRIPTORS: HEAT ENGINES, FLOW CONTROL, TURBINES

IDENTIFIERS: FUEL FLOW CONTROL, TURBOPROP ENGINE, ENGINE POWER CONTROL SYSTEM, CONSTANT SPEED PROPELLER GOVERNOR, CONTAMINATED OR VARIED FUELS, COMPUTER SECTION OF ENGINE POWER CONTROL SYSTEM, ENGINE OIL WORKING MEDIA, CORRECT TORQUE, CORRECTED SPEED

SECTION CLASS CODES: C7551, C7326

AN ENGINE POWER CONTROL SYSTEM FOR A TURBO-PROP ENGINE EQUIPPED WITH A CONSTANT SPEED PROPELLER GOVERNOR IS PROVIDED WITH MEANS TO MANIPULATE FUEL FLOW IN RESPONSE TO THE CORRECT TORQUE AND CORRECTED SPEED OF THE ENGINE. THE COMPUTER SECTION OF THE ENGINE POWER CONTROL SYSTEM USES ENGINE OIL AS THE WORKING MEDIA. THESE FEATURES ENABLE CONTAMINATED FUEL, OR FUELS OF VARYING QUALITY TO BE USED, WITHOUT REQUIRING FILTRATION OR COMPENSATING ADJUSTMENTS TO THE CONTROL SYSTEM

239290 C7106538
FLUIDIC DIGITAL CONTROL APPARATUS HAVING MULTI-PHASE CONTROL FREQUENCY
EASTMAN, J.M.
PATENT NO.: USA 3532081 ASSIGNEES: BENDIX CORP. FILED: 14 MARCH 1968
ORIGINAL PATENT APPL. NO.: USA 712976
6 OCT. 1970
DESCRIPTORS: FLUIDICS, DIGITAL CONTROL
IDENTIFIERS: DIGITAL CONTROL, FLUIDIC, MULTIPHASE, CONTROL FREQUENCY, ENGINE GOVERNOR, PULSE GENERATOR, SPEED ERROR, BEAT FREQUENCY
SECTION CLASS CODES: C7463

REFERS TO AN ENGINE GOVERNOR APPARATUS HAVING A REFERENCE SPEED VARIABLE FREQUENCY FLUID PULSE GENERATOR AND AN ENGINE SPEED VARIABLE FREQUENCY FLUID PULSE GENERATOR, ONE OF WHICH GENERATES A FOUR PHASE FLUID PULSE OUTPUT AGAINST WHICH THE OTHER FLUID PULSE GENERATOR OUTPUT IS COMPARED. THE REFERENCE SPEED AND ENGINE SPEED FLUID PULSES PROVIDE A CONTROL INPUT TO A PLURALITY OF PULSE OPERATED FLUIDIC DEVICES WHICH RESPOND TO THE OUTPUTS OF THE TWO GENERATORS IN ACCORDANCE WITH A SYNCHRONIZATION OF THE PULSE OUTPUT OF THE OTHER GENERATOR WITH THE FOUR PHASE PULSE OUTPUT OF THE ONE GENERATOR. THE DIRECTION OF ENGINE SPEED ERROR IS ESTABLISHED BY THE ORDER OF SYNCHRONIZATION OF THE FOUR PHASE PULSE OUTPUT AND THE COMPARED PULSE OUTPUT. THE MAGNITUDE OF THE SPEED ERROR IS ESTABLISHED BY THE FREQUENCY AT WHICH THE PULSES SYNCHRONIZE. A CONTROL FLUID PULSE OUTPUT AT THIS SYNCHRONIZATION OR :BEAT: FREQUENCY IS GENERATED BY EITHER OF TWO FLUIDIC DEVICES ONE OF WHICH IS CONNECTED TO RESPOND TO THE FOUR PULSE OUTPUTS IN A FIRST SEQUENTIAL ORDER REPRESENTING ENGINE OVERSPEED AND THE OTHER OF WHICH IS CONNECTED TO RESPOND TO THE FOUR PULSE OUTPUTS IN A SECOND SEQUENTIAL ORDER REPRESENTING ENGINE UNDERSPEED. THE ENGINE FUEL FLOW RATE IS CAUSED TO STEP UP OR DOWN IN SMALL INCREMENTS WITH THE CONTROL FLUID PULSES. AN ANALOG PROPORTIONAL GOVERNING ACTION IS ADDED TO THIS DIGITAL GOVERNING ACTION

227927 C7104841
SPACECRAFT CONTROL
REPORT NO.: UNNUMBERED ISSUED BY: CALIFORNIA INST. TECHNOL., PASADENA, USA
31 DEC. 1969
DESCRIPTORS: AEROSPACE CONTROL, ELECTRIC SENSING DEVICES, ELECTRICAL CONTROL EQUIPMENT, STABILITY, SPACE VEHICLE
IDENTIFIERS: SPACECRAFT CONTROL, DIGITAL SUN SENSOR, GRAY CODED DIGITAL SIGNAL, THRUST VECTOR CONTROL ANALYSIS, SOLAR ELECTRIC ION ENGINE, TORQUE, RATE INFORMATION, POSITION ERROR, FILTERING TECHNIQUES INVESTIGATION, ELECTROMAGNETIC ACCELEROMETER, EVALUATION, STABILITY, THERMAL STERILIZATION CAPABILITIES
SECTION CLASS CODES: C7576, C7421
AVAILIABILITY: CFSTI, SPRINGFIELD, VA. 22151, USA
A DIGITAL SUN SENSOR IS DESCRIBED THAT USES A LINE IMAGE OF THE SUN ON A DIGITAL DETECTOR TO PROVIDE THE SUN ANGLE IN TERMS OF A GRAY-CODED DIGITAL SIGNAL. A SINGLE-AXIS BREADBOARD DESIGN HAVING A 5-DEGREE FIELD-OF-VIEW HAD AN OUTPUT OF AN 8-BIT DIGITAL WORD. DYNAMIC ANALYSIS OF THRUST VECTOR CONTROL FOR A SOLAR- ELECTRIC NON-ENGINE PROPELLED SPACECRAFT REVEALED THAT THE CONTROL TORQUE MUST BE LARGER THAN THE TORQUE GENERATED BY THE TRANSLATION OF THE ENGINE ARRAY IN ORDER TO INSURE STABILITY. A TECHNIQUE FOR DERIVING RATE INFORMATION HAS BEEN DEVELOPED AND APPLIED TO PRODUCE A SIGNAL THAT IS PROPORTIONAL TO THE POSITION ERROR. IT WAS DEMONSTRATED THAT SEQUENTIAL FILTERING TECHNIQUES MAY BE USED FOR INVESTING OR SELECTING CONTROL SYSTEM CONFIGURATIONS THROUGH TRADE-OFF ANALYSES. AN ELECTROMAGNETIC ACCELEROMETER WAS EVALUATED FOR STABILITY, THERMAL STERILIZATION CAPABILITIES, PERFORMANCE, AND SHOCK RESISTANCE

215920 C713406
BEA ENGINE OVERHAUL REWORK SCHEDULING AT HEATHROW AIRPORT
FRY, M.
; BRITISH COMPUTER SOC
DATAWARE: DATA CAPTURE TODAY 9 1970
14-15 APR 1970 BRITISH COMPUTER SOC HULL, YORKS, ENGLAND
PUBL: BRITISH COMPUTER SOC. LONDON, ENGLAND
DESCRIPTORS: ADMINISTRATIVE DATA PROCESSING, AIRCRAFT, AEROSPACE APPLICATIONS OF COMPUTERS, MAINTENANCE ENGINEERING
SECTION CLASS CODES: C8640
EXTENDED ABSTRACT ONLY GIVEN, SUBSTANTIALLY AS FOLLOWS: THE REWORK SCHEDULING SYSTEM IS DESIGNED TO PRODUCE DAILY WORK SCHEDULES AND DAILY PROGRESS LISTS WHICH THE MEN ON THE SHOP FLOOR FOLLOW TO REPAIR COMPONENTS IN PRIORITY ORDER TO MEET THE TARGET DATES. THIS ENABLES BEA:S HOLDINGS OF SPARE ENGINES AND COMPONENTS TO BE CONSIDERABLY REDUCED. A DESCRIPTION OF THE ENGINE OVERHAUL REWORK SCHEDULING SYSTEM OUTLINE, ITS ADVANTAGES AND WORKING ARE PRESENTED IN THE PAPER

215391 C712833
THE DESIGN OF A DIGITAL THREE-TERM CONTROLLER AS A TURBOJET ENGINE SPEED GOVERNOR USING DIGITAL SIMULATION METHODS. I. DIGITAL SIMULATION OF THE DYNAMIC BEHAVIOUR OF A TWO-SPOOL TURBOJET ENGINE. II. A DIGITAL THREE-TERM CONTROLLER AS A TURBOJET ENGINE SPEED GOVERNOR
COTTINGTEN, R.V.
REPORT NO.: ARC-30103 ISSUED BY: NAT. GAS TURBINE ESTAB., FARNBOROUGH, ENGLAND
1970
DESCRIPTORS: HEAT ENGINES, SPEED CONTROL, AEROSPACE CONTROL, SIMULATION, CONTROL SYSTEM SYNTHESIS, THREE-TERM CONTROL, DIGITAL CONTROL
SECTION CLASS CODES: C7551, C7575, C6210, C7322, C6120
AVAILIABILITY: CFSTI, SPRINGFIELD, VA. 22151, USA
THE DYNAMIC BEHAVIOR OF A TWO-SPOOL TURBOJET ENGINE CAN BE DEFINED MATHEMATICALLY AND THUS SIMULATED IN A GENERAL PURPOSE DIGITAL COMPUTER. THE TECHNIQUE IS DESCRIBED TOGETHER WITH A BRIEF STATEMENT OF THE MATHEMATICAL THEORY. COMPARISON IS MADE BETWEEN THE BEHAVIOR OF A REAL ENGINE AND THAT OBTAINED FROM ITS DIGITAL SIMULATION, AND, IN GENERAL, GOOD AGREEMENT IS FOUND. A BRIEF DISCUSSION OF THE COMPARATIVE MERITS OF DIGITAL AND ANALOG SIMULATION IS ALSO PRESENTED. A DIGITAL THREE-TERM CONTROLLER AS A TURBOJET ENGINE ROTOR SPEED GOVERNOR WAS INVESTIGATED ON A TWO-SHAFT TURBOJET. THE CONTROLLER LOGIC WAS PROGRAMMED INTO A SPECIAL PURPOSE DIGITAL COMPUTER ON-LINE TO THE ENGINE. A NOVEL WAY OF APPLYING THE MODEL REFERENCE ADAPTATION TECHNIQUE WAS USED TO OPTIMIZE CONTROLLER GAIN SETTINGS OFF-LINE USING A DIGITAL SIMULATION FOR STEADY STATE AND TRANSIENT ENGINE BEHAVIOR. THE RESULTS FROM THE ENGINE TEST AND THE DIGITAL SIMULATION ARE PRESENTED

210910 C711133
ENGINE CONTROL BY DIGITAL COMPUTER
INDIAN AND E.ENG. VOL. 112, NO. 4 249 APRIL 1970
DESCRIPTORS: AEROSPACE APPLICATIONS OF COMPUTERS, DIRECT DIGITAL CONTROL, ON LINE OPERATION
SECTION CLASS CODES: C7575, C8829
THE OLYMPUS 593 FOR THE CONCORDE SUPERSONIC AIRLINER HAS A FULLY TRANSISTORIZED ANALOGUE CONTROL SYSTEM THAT IS AMONG THE MOST ADVANCED IN THE WORLD. THE NEXT STAGE IN ENGINE CONTROL TECHNOLOGY IS LIKELY TO BE THE INTRODUCTION OF DIGITAL CONTROL SYSTEMS, WHICH DEVELOPMENT IS DISCUSSED

188203 C7018688
MATHEMATICAL MODEL OF AN INTERNAL COMBUSTION ENGINE AND DYNAMOMETER TEST RIG
MONK, J., COMFORT, J. ; UNIV. WARWICK, ENGLAND
MEAS. AND CONTROL (GB) VOL. 3, NO. 6 T93-100 JUNE 1970
DESCRIPTORS: MODELLING, HEAT SYSTEMS, ANALOGUE COMPUTER METHODS, SIMULATION
SECTION CLASS CODES: C6120, C7551
AN ELECTRICAL CIRCUIT MODEL AND AN ANALOG COMPUTER SIMULATION HAVE BEEN DEVELOPED TO REPRESENT THE DYNAMIC BEHAVIOUR OF AN IC ENGINE AND EDDY CURRENT DYNAMOMETER SYSTEM. VARIOUS REFINEMENTS TO THE MODEL ARE INTRODUCED AND ITS PERFORMANCE IS COMPARED WITH THAT OF THE REAL SYSTEM USING PSEUDO-RANDOM BINARY SEQUENCE AND SINEWAVE TESTING TECHNIQUES. A BRIEF DESCRIPTION OF THE NECESSARY INSTRUMENTATION AND INTERFACING IS INCLUDED

175723 B7032322, C7017222
ELECTRONIC COMPUTERS, SIMULATORS AND TRAINING AIDS FOR SHIP-BORNE EQUIPMENT
TRANI, I.
ALTA FREQUENZA (ITALY) VOL.74, NO.SUPP.5 86-91 MAY 1970
DESCRIPTORS: SHIPS, COMPUTER APPLICATION, ENGINEERING APPLICATIONS OF COMPUTERS, SIMULATION, MARINE SYSTEMS
SECTION CLASS CODES: B2740, C7574, B2619, C8829
LANGUAGE: ITALIAN
MODERN ADVANCES IN SHIPBUILDING PRACTICE, PARTICULARLY THE INCREASE IN SIZE AND THE INTRODUCTION OF CONTAINER SHIPS AND BULK CARRIERS, CALL INCREASINGLY FOR AUTOMATION OF ENGINE CONTROL, NAVIGATION, GUIDANCE AND CARGO HANDLING. DIGITAL AND ANALOG COMPUTERS AND DATA PROCESSING FACILITIES ARE UTILIZED, WITH TRANSDUCERS AT THE PHYSICAL INTERFACES. COMPUTERS ARE USED IN SHIP DESIGN, FOR MODELLING AND OPTIMIZATION OF ENGINE OPERATION AND CONTROL. SIMULATORS PLAY AN IMPORTANT PART IN ON-SHORE TRAINING OF CREWS

170777 C7018030
STUDY OF INDUCER LOAD AND STRESS (INTERIM REPORT 15 FEB 1968-15 OCT 1968)
BARTEN, H.J., COONS, L.L., DAVIS, R.E.
REPORT NO.: NASA-CR-72514 ISSUED BY: PRATT AND WHITNEY AIRCRAFT, WEST PALM BEACH, FLA., USA
CONTRACT NO.: NAS3-11216
2 APRIL 1969
DESCRIPTORS: HEAT SYSTEMS, ENGINEERING APPLICATIONS OF COMPUTER, COMPUTER-AIDED DESIGN
SECTION CLASS CODES: C8829
AVAILIABILITY: CFSTI, SPRINGFIELD, VA. 22151, USA
A PROGRAM OF ANALYSIS, DESIGN, FABRICATION, AND TESTING IS BEING CONDUCTED TO DEVEOP COMPUTER PROGRAMS FOR PREDICTING ROCKET ENGINE TURBO-PUMP INDUCER HYDRODYNAMIC LOADING STRESS MAGNITUDE AND DISTRIBUTION, AND VIBRATION CHARACTERISTICS. THIS REPORT COVERS THE ANALYSIS AND DESIGN PORTION OF THE PROGRAM. METHODS OF PREDICTING BLADE LOADING STRESS, AND VIBRATION CHARACTERISTICS WERE SELECTED FROM A LITERATURE SEARCH AND USED AS A BASIS FOR THE COMPUTER PROGRAMS. A TEST INDUCER WAS DESIGNED REPRESENTATIVE OF TYPICAL ROCKET ENGINE INDUCERS AND INSTRUMENTATION WAS SELECTED TO PROVIDE MEASUREMENTS OF BLADE SURFACE PRESSURE AND STRESSES FOR CORRELATION WITH THE PREDICTION SYSTEM

161350 C7015407
DIGITAL COMPUTER SIMULATION OF A DIESEL FUEL INJECTION
DUBE, J.P., GOYAL, M.R. ; GOVERNMENT ENGNG. COLL., REWA, INDIA
J. INSTN. ENGRS. (INDIA) MECH. ENGNG. DIV. VOL.50, NO.5, PT.ME3 132-48 JAN. 1970
DESCRIPTORS: MECHANICAL ENGINEERING, ENGINEERING APPLICATIONS OF COMPUTERS, HEAT SYSTEMS, SIMULATION
SECTION CLASS CODES: C8829, C7551
THE PAPER PRESENTS A DETAILED ANALYSIS OF A DIESEL ENGINE FUEL INJECTION SYSTEM WHICH GIVES A PILOT INJECTION AND A MAIN INJECTION, USING A SINGLE PLUNGER HAVING TWO GROOVES TO GIVE STEPPED INJECTION THROUGH A SINGLE MULTI-HOLE, CLOSED NOZZLE. THE CALCULATION FOR SUCH AN INJECTION SYSTEM HAS BEEN PROGRAMMED FOR A DIGITAL COMPUTER. FINITE DIFFERENCE METHOD HAS BEEN USED FOR STEP BY STEP SOLUTION OF THE EQUATIONS AT EACH INTERVAL OF TIME. THE RESULTS PRESENTED WERE OBTAINED FOR A SET OF DATA TO SHOW THE EFFECT OF VARIOUS PUMP PARAMETERS ON THE DISCHARGE CHARACTERISTICS OF THE INJECTION SYSTEM DESIGN DATA (10 REFS)

161327 C7015384

DETERMINATION OF THE COMBUSTION LAW OF AN INTERNAL COMBUSTION ENGINE BY MEANS OF DIGITAL COMPUTERS USING THE INDICATED DIAGRAM

APOSTOLESCU, N., GRUNWALD, B., TARAZA, D.

BUL. INST. POLITEH. BUCCURESTI (RUMANIA) VOL.31, NO.4 105-14 JULY 1969

DESCRIPTORS: ENGINEERING APPLICATIONS OF COMPUTERS, HEAT SYSTEMS, FLOWCHARTING

SECTION CLASS CODES: C8829

LANGUAGE: RUMANIAN

THE AUTHORS PRESENT A METHOD TAKING INTO CONSIDERATION THE THERMAL DISCONTINUITIES OF THE GAS MIXTURE, THE DISSOCIATION OF GAS, FUEL ATOMIZATION AND HEAT EXCHANGE WITH THE WALLS. IN ORDER TO SOLVE THE EQUATION OBTAINED WHICH SPECIFIES THE LAW OF COMBUSTION THE AUTHORS SUGGEST THE RUNGE-KUTTA SECOND-ORDER METHOD, PRESENTING THE FLOW CHART OF THE CALCULATION PROGRAM ELABORATED FOR A DIGITAL COMPUTER

146232 C0011424

ANALOG COMPUTER CONTROL SYSTEMS FOR THE GROUND TESTING OF NUCLEAR ROCKET ENGINE COMPONENTS

LANGILL, A.W. : PROCESS SYSTEMS INSTRUMENTATION, SACRAMENTO, CALIF., USA

: INSTRUMENT SOC. AMERICA

PROCEDINGS OF THE 23RD ANNUAL ISA CONFERENCE, ADVANCES IN INTRUMENTATION 10PP. 1968

1 28-31 OCT 1968 INSTRUMENT SOC. AMERICA NEW YORK, USA

PUBL: INSTRUMENT SOC. AMERICA PITTSBURGH, PA., USA

DESCRIPTORS: NUCLEAR SYSTEMS, ON-LINE OPERATION, AUTOMATIC TESTING, ANALOGUE COMPUTER METHODS, ENGINEERING APPLICATIONS OF COMPUTERS

SECTION CLASS CODES: C8829

DESCRIBES THE APPLICATION OF THE LARGE-SCALE GENERAL-PURPOSE ANALOG COMPUTER FOR THE DESIGN OF CONTROL SYSTEMS USED IN THE NON-NUCLEAR TESTING OF NUCLEAR ROCKET ENGINE COMPONENTS AND SUB-SYSTEMS. FURTHER, THE APPLICATION OF ON-LINE ANALOG COMPUTER CONTROL OF GROUND TEST FACILITIES IS INDICATED. IN THIS CONTEXT, THE ON-LINE COMPUTER (EAI PC-12) IS EMPLOYED IN CONJUNCTION WITH HIGH-SPEED SERVO SUB-SYSTEMS TO (1) GENERATE ALL REQUIRED FORCING FUNCTIONS, (2) PROVIDE SWITCHING AND MALFUNCTION LOGIC SHUTDOWN COMMANDS, AND (3) PERFORM THE FUNCTIONS OF AN OVERALL SYSTEMS SUPERVISOR

132623 C709787
DYNAMIC MODELLING OF GAS TURBINE PERFORMANCE
SARAVANAMUTTOO, H.I.H., FAWKE, A.J.
; IEE, CONTROL AND AUTOMATION DIV., INSITUTE OF MEASUREMENT AND CONTROL
INDUSTRIAL APPLICATIONS OF DYNAMIC MODELLING 133-41 1969
16-18 SEP 1969 IEE, CONTROL AND AUTOMATION DIV., INSITUTE OF MEASUREMENT AND CONTROL DURHAM, ENGLAND
PUBL: INSTITUTION OF ELECTRICAL ENGINEERS LONDON
DESCRIPTORS: ANALOGUE COMPUTER METHODS, SIMULATION, AEROSPACE APPLICATIONS OF COMPUTERS, HEAT SYSTEMS
SECTION CLASS CODES: C8829
METHODS FOR DYNAMIC MODELLING OF GAS TURBINE PERFORMANCE HAS BEEN DEVELOPED FOR BOTH ANALOGUE AND DIGITAL COMPUTERS. THE PROBLEM IS APPROACHED FROM THE VIEWPOINT OF THE THERMODYNAMICIST, USING THE BASIC INFORMATION REQUIRED FOR STEADY STATE PERFORMANCE CALCULATIONS. BOTH ANALOGUE AND DIGITAL SIMULATION METHODS HAVE PROVED TO BE SATISFACTORY, AND GOOD AGREEMENT WITH ENGINE TESTS HAS BEEN OBTAINED. THIS PAPER DISCUSSES THE SIMULATION OF THE SIMPLE TURBOJET ENGINE, AND THE METHODS DESCRIBED ARE CURRENTLY BEING USED TO SIMULATE THE PERFORMANCE OF MORE COMPLEX TWO-SPOOL AND THREE- SPOOL UNITS. THE COMPUTER REQUIREMENTS ARE MODEST AND WELL WITHIN THE SCOPE OF REASONABLY EQUIPPED COMPUTER LABORATORIES

114174 C706317
CALCULATION OF DIESEL ENGINES WORKING PROCESSES, AND THE APPLICATION OF DIGITAL COMPUTERS FOR SUCH CALCULATIONS
KALMAR, I.
WISS. Z. TECH. HOCHSCH. OTTO VON GUERICKE MAGDEBURG (GERMANY) VOL.12, NO.4 483-91 1968
DESCRIPTORS: HEAT SYST., COMP. AIDED DESIGN, ENG. APPLIC. COMP., DESIGN AND CALC. AIDS
SECTION CLASS CODES: C8829
LANGUAGE: GERMAN
THE NUMBER OF EXPERIMENTS DURING DEVELOPMENT OF AN ENGINE CAN BE REDUCED BY THE STUDY OF DIESEL ENGINE INDICATOR DIAGRAMS. WHEN THE COMPUTATION METHOD IS LAID DOWN, COMPUTATION BY HAND IS COMPARED WITH THAT BY A COMPUTER. THE VIBE COMBUSTION LAW AND THE HEAT TRANSFER EQUATIONS BY PFLAUME WERE USED WITH THE COMPUTER. THE MATCHING OF THE COMPUTATION RESULT TO AN ENGINE INDICATOR DIAGRAM, AND THE EFFECT OF A SINGLE PARAMETER COMPUTED BY THE PROGRAM SO DETERMINED, ARE GIVEN (11 REFS)

114172 C706315
COMPUTER MODEL FOR CALCULATING THE BURNT CHARGE VOLUME AND THE SURFACE AREA OF THE PROPAGATING FLAME IN A SPARK IGNITION ENGINE
SOMAYAJULU, K.D.S.R., SUBRAHMANYAM, J.K.
J. INSTN. ENGRS. (INDIA), MECH. ENGNG. DIV. VOL. 49, NO. 11, PT. ME6 298-302 JULY 1969
DESCRIPTORS: ENG. APPLIC. COMP., HEAT SYSTEMS
SECTION CLASS CODES: C8829
IN A COMBUSTION CHAMBER DESIGN, THE VOLUME OF THE CHARGE BURNT AND THE SURFACE AREA OF THE FLAME FRONT AS THE FLAME PROPAGATES ARE IMPORTANT CONSIDERATIONS. A METHOD OF CALCULATION TO BE SOLVED ON A DIGITAL COMPUTER IS DESCRIBED. THE METHOD ENVISAGES DETERMINING THE VOLUME COMMON TO A SPHERE AND THE COMBUSTION CHAMBER. THE POINTS ON THE BOUNDARY OF THE COMBUSTION CHAMBER ARE GIVEN IN CARTESIAN COORDINATES ABOUT A CONVENIENT ORIGIN. THE POINTS ARE CONVERTED INTO SPHERICAL COORDINATES WITH THE SPARK PLUG LOCATION AS THE ORIGIN. A SYSTEMATIC PROCEDURE FINDS THE RADIUS AS THETA AND PHI ARE CHANGED AND COMPUTES BY SUMMATION, THE VOLUME AND SURFACE AREA FOR SEVERAL FLAME RADII. LIMITATIONS AND ADVANTAGES OF THE METHOD ARE DESCRIBED

67901 B6921645, C699490
COMPUTER DATA PROCESSING TO COMPUTE NERVA TRANSFER FUNCTIONS
BENENSON, H.
; ATOMIC ENERGY OF CANADA LTD U.S.A.E.C. NASA
IEEE TRANS. NUCLEAR SCI. (USA) VOL.S-16, NO.1 207-9 FEB. 1969
CONF: 15TH NUCLEAR SCIENCE SYMPOSIUM 23-25 OCT 1968 ATOMIC ENERGY OF CANADA LTD U.S.A.E.C. NASA MONTREAL, CANADA
DESCRIPTORS: AEROSPACE PROPULSION, COMPUTER APPLICATIONS, NUCLEAR REACTORS, AEROSPACE APPLICATIONS OF COMPUTERS, ENGINEERING APPLICATIONS OF COMPUTERS
SECTION CLASS CODES: B3630, C8829
THIS PAPER DESCRIBES THE COMPUTER DATA-PROCESSING METHODS THAT HAVE BEEN DEVELOPED TO PERMIT TOTAL DATA ANALYSIS COMPLETION WITHIN A 72-HR PERIOD. TO ACHIEVE THIS GOAL, IT WAS NECESSARY TO ESTABLISH EFFICIENT AND FLEXIBLE PROGRAMMING METHODS AND TO ENSURE THAT THE DATA ARE VALID WHEN THE TESTS ARE CONDUCTED. BECAUSE INTERPRETATION IS ESSENTIAL, A WELL PLANNED SYSTEMATIC APPROACH TO VERIFICATION AND SIMULATION WAS INTRODUCED EARLY IN THE PROGRAM TO STUDY AND INTERPRET ANOMALIES THAT COULD OCCUR IN THE DATA

65082 C6911088
SIMPLIFIED SIMULATION OF ENGINE DYNAMICS
STRAUBINGER, A.
LUFTFAHRTTECHN. RAUMFAHRTTECH. (GERMANY) VOL.15, NO.1 1-5 JAN. 1969
DESCRIPTORS: SIMULATION, ANALOGUE COMPUTERS, ENGINEERING APPLICATIONS OF COMPUTERS
SECTION CLASS CODES: C8829, C9950
LANGUAGE: GERMAN
THERE ARE THREE METHODS WHICH CAN BE USED TO SIMULATE ENGINE DYNAMICS ON ANALOG COMPUTERS WITH ADEQUATE ACCURACY. IT DEPENDS ON THE PURPOSE OF THE INVESTIGATION, THE COMPUTER CAPACITY AND THE TYPE OF THE AVAILABLE ENGINE DATA, WHICH OF THE THREE METHODS IS TO BE USED IN A GIVEN CASE

37716 P6912430, C694132
SOME CONSIDERATIONS ON THE POSSIBILITY OF THE ADAPTION OF MARINE ELECTRICAL PROPULSION TO REMOTE CONTROL OR PROGRAMMED SYSTEM CONTROL
RAVENNA, L.
MARELLI (ITALY) VOL.42, NO.7-12 7-28 DEC. 1968
DESCRIPTORS: PROPULSION, COMPUTER APPLICATIONS, MOTORS, SHIPS, MARINE SYSTEMS
SECTION CLASS CODES: B4610, C7574
LANGUAGE: ITALIAN
AN HISTORICAL ACCOUNT IS GIVEN OF EARLY SYSTEMS OF DIESEL- ELECTRIC PROPULSION, WITH PARTICULAR REFERENCE TO THE (ITALIAN) VESSELS SCILLA AND CARIDDI. THE APPLICATION OF ELECTRIC PROPULSION TO DIFFERENT CLASSES OF VESSEL IS CONSIDERED, TOGETHER WITH A DETAILED INVESTIGATION OF THE ALTERNATIVE FORMS OF PRIME MOVER, ELECTRIC CONVERSION AND PROPULSION MOTOR. INFORMATION ON RELEVANT COSTS IS PRESENTED, AND THE ARTICLE CONCLUDES WITH A DETAILED ACCOUNT OF TWO RECENT MARINE INSTALLATIONS WHICH HAVE INCORPORATED COMPUTER CONTROL FOR SOME OF THE ROUTINE ENGINE ROOM OPERATIONS

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Set Items Description
  1     64 VOLTAGE
  2    990 SPEED
  3      3 RPM
  4   1054 1-3/OR
  5     35 REGULATOR
  6     20 GOVERNOR
  7   4182 CONTROL
  8   4208 5-7/OR
  9    828 ENGINE
 10    203 GENERATOR
 11     14 ROTATING MACHINERY
 12      2 ALTERNATING CURRENT
 13   1030 9-12/OR
 14     51 SWITCHING
 15      0 PROPORTIONAL BAND
 16     25 PROPORTIONAL
 17      0 BANG BANG
 18      2 BANG(W)BANG
 19      0 PROPOTIONAL(W)BAND
 20     78 14-19/OR
 21      1 4 AND 8 AND 13 AND 20
 22     11  4 AND 8 AND 13
 23   1209 COMPUTER
 24    252 DIGITAL
 25      0 MICROPROCESSOR
 26      0 MICRO PROCESSOR
 27      0 MICRO(W)PROCESSOR
 28     34 MINICOMPUTER
 29   1387 23-28/OR
 30     41 13 AND 29

Print 22/5/1-11
Print 30/5/1-41

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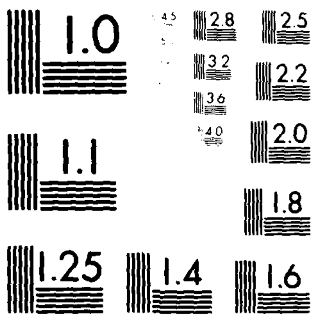
AD-A085 990 NAVAL AIR ENGINEERING CENTER LAKEHURST NJ GROUND SUPP--ETC F/G 10/2
APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT--ETC(U)
MAY 80 R F O'DONNELL
UNCLASSIFIED NAEC-92-139 NL

3 OF 4
AD
A085 990



MICROCOPY RESOLUTION TEST CHART

36495 D7506320
DESIGN OF DIGITAL ACTUATORS (PNEUMATIC DRIVES EXAMPLES)
USAMOV, KH.G.
VESTN. MASHINOSTR. (USSR) NO.11 29-32 1974 CODEN: VMASAV
TRANS OF: RUSS. ENG. J. (GB) VOL.54, NO.11 32-4 1974 CODEN: RENJA3
DESCRIPTORS: ACTUATORS, DESIGN, PNEUMATIC CONTROL EQUIPMENT
IDENTIFIERS: SPRING TENSIONING, DESIGN, DIGITAL ACTUATORS, PNEUMATICALLY ACTUATED DRIVES, VARIABLE SPEED REGULATOR, DIESEL ENGINE, CENTRIFUGAL SWITCH, AUTOMATIC SWITCHING SYSTEMS, DIESEL ELECTRIC LOCOMOTIVES, CONTROLLER, POSITIONERS
SECTION CLASS CODES: D2450
(4 REFS)

28761 D7506126
(DIESEL) ENGINE TEST BED MODEL FOR DYNAMIC CONTROL STUDIES
AL-BERMANI, S.A., GRAVESTOCK, R.E. ; QUEEN MARY COLL., LONDON, ENGLAND
J. AUTOMOT. ENG. (GB) VOL.6, NO.1 10-15 FEB. 1975 CODEN: JAUEA9
DESCRIPTORS: DIESEL ENGINES, TEST FACILITIES, DYNAMICS, TORQUE
IDENTIFIERS: DYNAMIC CONTROL, ANALOGUE COMPUTER MODEL, DIESEL ENGINE, EDDY CURRENT DYNAMOMETER TEST BED, STEADY STATE, DYNAMIC TORQUE FUNCTIONS, SPEED CONTROLLER, TRANSFER FUNCTION, THROTTLE ACTUATOR
SECTION CLASS CODES: D5410, D1370
(6 REFS)

25013 D7502378
TORSIONAL STABILITY ANALYSIS OF A GAS-TURBINE POWERED HELICOPTER DRIVE SYSTEM
DARLOW, M.S., VANCE, J.M. ; MECH. TECHNOL. INC., LATHAM, N.Y., USA
TRANS. ASME SER. A (USA) VOL.96, NO.4 335-41 OCT. 1974 CODEN: JETOA8
DESCRIPTORS: HELICOPTERS, TORSION, STABILITY, DRIVES, GAS TURBINES
IDENTIFIERS: TORSIONAL STABILITY ANALYSIS, CLOSED LOOP DYNAMIC SYSTEM, TRANSPORT HELICOPTER SPEED GOVERNOR, GAS TURBINE ENGINE, DRIVE TRAIN, NONLINEAR COUPLING, VIBRATIONS, ROTOR, EXCITATION, TIME RESPONSE, FREQUENCY
SECTION CLASS CODES: D6610, D5510, D5420
(9 REFS)

23110 D7500475
WHAT:S NEW IN MOTORCYCLE ENGINEERING
COVINGTON, J.
AUTOMOT. ENG. (USA) VOL.82, NO.9 37-43 SEPT. 1974 CODEN: AVEGBI
DESCRIPTORS: DESIGN, SAFETY, POLLUTION, INTERNAL COMBUSTION ENGINES, MOTOR VEHICLE BRAKES, MOTOR VEHICLE SUSPENSION
IDENTIFIERS: WOBBLE, ANTI LOCK BRAKES, MOTORCYCLE TECHNOLOGY, ENGINE EFFICIENCY, OUTPUT, BRAKING, SAFETY FACTORS, SUSPENSION SYSTEMS, NOISE , EMISSIONS CONTROL, DESIGN, AUTOMOTIVE APPLICATIONS, COMPUTER, PREDICT, SPEED/TORQUE CHARACTERISTICS, AUTOMATED DESIGN
SECTION CLASS CODES: D6290, D5410, D1340

21808 D7406802
IMPROVED WEAR AND DEPOSIT CONTROL IN MEDIUM SPEED MARINE DIESEL ENGINES (WITH ENGINE OIL DEVELOPMENT)
VAN DER HORST, G.W., POLMAN, J., SUNDERMEIJER, J.J.H. ; CHEVRON CENTRAL LAB., ROTTERDAM, NETHERLANDS
STD BOOK NO.: 9 900976 37 3
EUROPORT 73 CONFERENCE PROCEEDINGS: MARINE DIESEL ENGINES 1-12 1974
15 NOV. 1973 AMSTERDAM, NETHERLANDS
PUBL: INST. MARINE ENGRS. LONDON, ENGLAND
DESCRIPTORS: MARINE ENGINES, DIESEL ENGINES, WEAR, OIL
IDENTIFIERS: WEAR, DEPOSIT CONTROL, MEDIUM SPEED MARINE DIESEL ENGINES, ENGINE OILS, LABORATORY BENCH TESTS, OXIDATION, THERMAL STABILITY, CORROSION PROTECTION, WATER TOLERANCE
SECTION CLASS CODES: D5410, D3650, D3690
(2 REFS)

21800 D7406794
TURBOCHARGING OF SMALL (DIESEL) ENGINES
GOODLET, I.W. ; HOLSET ENGNG. CO. LTD., HUDDERSFIELD, ENGLAND
PROC. INST. MECH. ENG. (GB) VOL. 188 NO.3 77-87 1974 CODEN: PIMLAA
DESCRIPTORS: DIESEL ENGINES, TURBOCHARGERS, INTERNAL COMBUSTION ENGINE PERFORMANCE
IDENTIFIERS: LOST WAX CAST ROTORS, SMALL DIESEL ENGINES, TURBOCHARGING, ADOPTION, RADIAL FLOW TURBINES, COMPONENT EFFICIENCIES, BEARING, SEAL DESIGN PROBLEMS, VANE VIBRATION, MANUFACTURING METHODS, CONTROL SYSTEMS, DEMANDS, VARIABLE SPEED ENGINES
SECTION CLASS CODES: D5410
(8 REFS)

14190 D7406696
OPERATION AND CONTROL OF INDUSTRIAL TURBINES (E.G. ELECTRIC GENERATOR DRIVES)
WILSON, W.B. ; GENERAL ELECTRIC CO., SCHENECTADY, N.Y., USA
POWER ENG. (USA) VOL.78, NO.2 42-5 FEB. 1974
DESCRIPTORS: STEAM TURBINES, STEAM-ELECTRIC POWER GENERATION, VELOCITY CONTROL, ELECTRIC VARIABLES CONTROL
IDENTIFIERS: CONTROL, INDUSTRIAL TURBINES, OPERATION, COSTS, ELECTRIC GENERATOR DRIVES, STEAM TURBINE, STEP LOAD CHANGE, SPEED GOVERNOR REGULATION, CONTROL PERFORMANCE
SECTION CLASS CODES: D5440, D8210, D2230

12911 D7405417
PROTOTYPE OF A 100-MW, 3000 RPM GAS TURBINE SERIES FOR POWER GENERATION
FRIGIERI, G.P. ; FIAT, TORINO, ITALY
; ASME
INTERNATIONAL CONFERENCE ON GAS TURBINES (PREPRINTS) 1-9 1974
31 MARCH - 4 APRIL 1974 ASME ZURICH, SWITZERLAND
PUBL: ASME NEW YORK, USA
DESCRIPTORS: GAS TURBINES, POWER PLANTS, CONTROL SYSTEMS
IDENTIFIERS: PROTOTYPE, GAS TURBINE, POWER GENERATION, LARGE, CHARACTERISTICS, PEAK LOAD, ENGINE, DESIGN, TEST PROGRAM, CONTROL SYSTEM, PACKAGE INSTALLATION, 100 MW, 3000 RPM, BASE LOAD
SECTION CLASS CODES: D5420, D8250

6680 D7306680
HYBRID MODEL OF AN AUTOMATED ENGINE TEST BED
SOLIMAN, J.I.
J. AUTOMOT. ENG. (GB) VOL.4, NO.5 13-18 OCT. 1973 CODEN: JAUEA9
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, MODELLING, TEST FACILITIES, CONTROL SYSTEMS
IDENTIFIERS: CONTROL, HYBRID MODEL, AUTOMATED, TEST BED, SPEED, TORQUE, INTERNAL COMBUSTION ENGINE
SECTION CLASS CODES: D5410

5471 D7305471
A PRELIMINARY STUDY OF THE DESIGN OF A CONTROLLER FOR AN AUTOMOTIVE GAS TURBINE (MATHEMATICAL MODELLING)
WINTERBONE, D.E., MUNRO, N., LOURTIE, P.M.G. ; UNIV. MANCHESTER, ENGLAND
TRANS. ASME SER. A (USA) VOL.95, NO.3 244-50 JULY 1973 CODEN: JEPOA8
DESCRIPTORS: GAS TURBINES, CONTROLLERS
IDENTIFIERS: DESIGN, CONTROLLER, AUTOMOTIVE GAS TURBINE, FUEL MASS FLOW, TURBINE NOZZLE ANGLE, GAS GENERATOR SPEED, TURBINE INLET TEMPERATURE, CONTROL SYSTEM, MATHEMATICAL MODELS
SECTION CLASS CODES: D5420, D2410
(10 REFS)

71 D7300071
DEVELOPMENTS IN HIGH-VOLTAGE GENERATION AND IGNITION CONTROL (FOR COMBUSTION ENGINES)
RITTMANNSBERGER, N. ; ROBERT BOSCH GMBH, SCHWIEBERDINGEN, GERMANY ; INSTN. MECH. ENGRS
STD BOOK NO.: 0 85298 060 4
CONFERENCE ON AUTOMOTIVE ELECTRICAL EQUIPMENT 79-84 1973
13-14 SEPT. 1972 INSTN. MECH. ENGRS BRIGHTON, SUSSEX, ENGLAND
PUBL: INSTN. MECH. ENGRS. LONDON, ENGLAND
DESCRIPTORS: IGNITION SYSTEMS, INTERNAL COMBUSTION ENGINES
IDENTIFIERS: DEVELOPMENTS, IGNITION CONTROL, TRANSISTORIZED METHODS, CONTACTLESS TRIGGER SYSTEMS, SPARK IGNITED COMBUSTION ENGINE, HIGH VOLTAGE GENERATION, COIL IGNITION
SECTION CLASS CODES: D2450, D5410, D5320
(3 REFS)

39132 D7601423
THE PREDICTION OF JOURNAL LOCI IN DYNAMICALLY LOADED INTERNAL COMBUSTION ENGINE BEARINGS
RITCHIE, G.S. ; MECH. ENGNG. LAB., GEC, WHETSTONE, ENGLAND
WEAR (SWITZERLAND) VOL.35, NO.2 291-7 DEC. 1975 CODEN: WEARAH
DESCRIPTORS: DIESEL ENGINES, INTERNAL COMBUSTION ENGINE COMPONENTS, COMPUTER-AIDED DESIGN, JOURNAL BEARINGS, OPTIMISATION
IDENTIFIERS: SEMIANALYTIC METHOD, DYNAMICALLY LOADED BEARINGS, PREDICTION OF JOURNAL LOCI, INTERNAL COMBUSTION ENGINE BEARINGS, DIESEL ENGINE BEARINGS, APPROXIMATE SOLUTION, DYNAMIC REYNOLDS EQUATION, COMPUTER PROGRAM
SECTION CLASS CODES: D3610, D5410
(2 REFS)

38910 D7601201
LATERAL VIBRATION ANALYSIS OF GENERATOR-TURBINE SHAFT SYSTEMS
NAGAFUJI, T. ; TOKYO SHIBAURA ELECTRIC CO. LTD., HEAVY APPARATUS ENGNG. LAB., YOKOHAMA, JAPAN
INT. WATER POWER AND DAM CONSTR. (GB) VOL.27, NO.11 418-23 NOV. 1975 CODEN: IWPCDM
DESCRIPTORS: TURBOGENERATORS, SHAFTS, VIBRATIONS
IDENTIFIERS: TRANSIENT RESPONSE, LATERAL VIBRATION ANALYSIS, GENERATOR TURBINE SHAFT, DESIGN, COMPUTER
SECTION CLASS CODES: D8250, D5510, D3220
(4 REFS)

38755 D7601046
HYBRID COMPUTER TREATMENT OF SAMPLED EXPERIMENTAL DATA FROM ROTATING PISTON MOTORS
CAILLIAU, R., SIEBENS, R. ; RIJKSUNIV. GENT, GENT, BELGIUM
REV.-M (BELGIUM) VOL.21, NO.3 251-9 SEPT. 1975 CODEN: RMRMAK
DESCRIPTORS: INTERNAL COMBUSTION ENGINE PERFORMANCE, ENGINEERING APPLICATIONS OF COMPUTERS, ROTARY ENGINES
IDENTIFIERS: ENGINE DATA ANALYSIS, HYBRID COMPUTER TREATMENT, SAMPLED EXPERIMENTAL DATA, ROTATING PISTON MOTORS, HYBRID INSTALLATION
SECTION CLASS CODES: D5410
LANGUAGE: FLEMISH
(9 REFS)

38032 D7600323
TEST ENGINES PRODUCED BY DNC (COMPUTER MACHINING CENTRE AND CONVEYOR SYSTEM)
ASHBURN, A.
AM. MACH. (USA) VOL.119, NO.19 114-16 OCT. 1975 CODEN: AMMAAA
DESCRIPTORS: NUMERICAL CONTROL, MACHINING CENTRES, INTERNAL COMBUSTION ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, CONVEYORS
IDENTIFIERS: MACHINING CENTRES, TOYOTA, DNC, CONVEYORS, COMPUTER CONTROLLED AND MONITORED SYSTEM, ENVIRONMENTAL TESTS, ENGINE PARTS, INTEGRATED PRODUCTION SYSTEM
SECTION CLASS CODES: D4410, D5410, D6720

37557 D7507382
SIMULATION STUDY OF TRANSIENT PERFORMANCE MATCHING OF TURBOFAN ENGINE USING AN ANALOGUE COMPUTER TO EVALUATE ITS USEFULNESS AS DESIGN TOOL
ITOH, M., ISHIGAKI, T., SAGIYA, Y. ; RES. AND DEV. DEPT., AIRCRAFT ENGINE DIV., ISHIKAWAJIMA-HARIMA HEAVY INDUSTRIES CO. LTD., TOKYO, JAPAN
TRANS. ASME SER. A (USA) VOL.97, NO.3 369-74 JULY 1975
CODEN: JEPOA8
DESCRIPTORS: TURBOFAN ENGINES, COMPUTER-AIDED DESIGN, SIMULATION
IDENTIFIERS: ANALOGUE COMPUTER SIMULATION, TRANSIENT PERFORMANCE MATCHING, TURBOFAN ENGINE, DESIGN TOOL, DYNAMIC RESPONSE, TRANSIENT SPEED CONDITION
SECTION CLASS CODES: D5420

36495 D7506320
DESIGN OF DIGITAL ACTUATORS (PNEUMATIC DRIVES EXAMPLES)
USAMOV, KH.G.
VESTN. MASHINOSTR. (USSR) NO.11 29-32 1974 CODEN: VMASAV
TRANS OF: RUSS. ENG. J. (GB) VOL.54, NO.11 32-4 1974 CODEN: RENJA3
DESCRIPTORS: ACTUATORS, DESIGN, PNEUMATIC CONTROL EQUIPMENT
IDENTIFIERS: SPRING TENSIONING, DESIGN, DIGITAL ACTUATORS, PNEUMATICALLY ACTUATED DRIVES, VARIABLE SPEED REGULATOR, DIESEL ENGINE , CENTRIFUGAL SWITCH, AUTOMATIC SWITCHING SYSTEMS, DIESEL ELECTRIC LOCOMOTIVES, CONTROLLER, POSITIONERS
SECTION CLASS CODES: D2450
(4 REFS)

36265 D7506090
INDUCTION RAMMING A MOTORED HIGH-SPEED FOUR-STROKE RECIPROCATING ENGINE-INFLUENCE OF INLET PORT PRESSURE WAVES ON VOLUMETRIC EFFICIENCY
PROSSER, T.G. ; KING:S COLL., UNIV. OF LONDON, LONDON, ENGLAND
PROC. INST. MECH. ENG. (GB) VOL.188, NO.49 577-84 1974
CODEN: PIMEAA
DESCRIPTORS: INTERNAL COMBUSTION ENGINE PERFORMANCE
IDENTIFIERS: MOTORED HIGH SPEED FOUR STROKE RECIPROCATING ENGINE, INDUCTION RAMMING, INFLUENCE OF INLET PORT PRESSURE WAVES, VOLUMETRIC EFFICIENCY, PRESSURE FLUCTUATIONS, COMPUTER PROGRAMME, METHOD OF CHARACTERISTICS, AIRFLOW FIGURES
SECTION CLASS CODES: D5410
(20 REFS)

35043 D7504868
CHRYSLER:S :ELECTRONIC: LEAN-BURN ENGINE (WITH SPARK-CONTROL COMPUTER)
MACH. DES. (USA) VOL.47, NO.17 24-6 10 JULY 1975 CODEN: MADEAP
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SPARK ADVANCE CONTROL, ELECTRONIC LEAN BURN ENGINE, CHRYSLER, COMPUTER, IGNITION, CIRCUIT BOARDS
SECTION CLASS CODES: D5410

35015 D7504840
A SIMPLE STEAM GENERATOR MODEL (DIGITAL SIMULATION)
LEITHNER, R., LINZER, V. ; LITERATURNACHWEIS AND BEISPIELE, STUTTGART, GERMANY
BRENNST.-WAERME-KRAFT (BWK) (GERMANY) VOL.27, NO.8 334-5 AUG. 1975 CODEN: BRWKAY
DESCRIPTORS: BOILERS, MODELLING, SIMULATION
IDENTIFIERS: STEAM GENERATOR MODEL, DIGITAL SIMULATION
SECTION CLASS CODES: D5220

34396 D7504221
MEASUREMENT OF AVERAGE INDICATOR DIAGRAMS BY A MINI-COMPUTER AIDED DATA ACQUISITION SYSTEM
KONTANI, K.
J. MECH. ENG. LAB. (JAPAN) VOL.29, NO.3 92-108 MAY 1975 CODEN: KGKSBL
DESCRIPTORS: INTERNAL COMBUSTION ENGINE PERFORMANCE
IDENTIFIERS: MEASUREMENT, AVERAGED INDICATOR DIAGRAMS, MINICOMPUTER AIDED DATA ACQUISITION SYSTEM, CONTINUOUS ENGINE CYCLES, PRESSURE, IGNITION TIMING
SECTION CLASS CODES: D5410
LANGUAGE: JAPANESE
(4 REFS)

30771 D7500596
VIBRATIONS OF ROTORS IN TURBINE UNITS WITH SHORT CIRCUIT OF THE GENERATOR (CALCULATION)
KOSINOV, YU.P., FILIPPOV, A.P. ; KHARKOV CENTRAL DESIGN OFFICE POWER GENERATION INDUSTRY, ACAD. SCI., UKRAINIAN SSR
TEPLOENERGETIKA (USSR) VOL.21, NO.6 70-3 JUNE 1974 CODEN: TPLOA5
TRANS OF: THERM. ENG. (GB) VOL.21, NO.6 97-101 1974 CODEN: THENAD
DESCRIPTORS: TURBOGENERATORS, VIBRATIONS, STRESSES
IDENTIFIERS: ROTORS, TURBINE UNITS, SHORT CIRCUIT, GENERATOR, CALCULATION, DYNAMIC STRESSES, DIGITAL COMPUTER, TORSIONAL VIBRATIONS
SECTION CLASS CODES: D8210, D5400, D3130
(7 REFS)

30647 D7500472
ENGINE DESIGN SERIES. III. THE CRANKSHAFT
AUTOMOT. DES. ENG. (GB) VOL.14 22-3 APRIL 1975 CODEN: ADEGBS
DESCRIPTORS: CRANKSHAFTS, DESIGN, INTERNAL COMBUSTION ENGINE COMPONENTS
IDENTIFIERS: MATERIALS, ENGINE DESIGN, CRANKSHAFT, COMPUTER ANALYSIS , STRESSES
SECTION CLASS CODES: D5410, D5510
(25 REFS)

29380 D7506745
CALCULATION PROCEDURES FOR POTENTIAL AND VISCOUS FLOW SOLUTIONS FOR ENGINE INLETS
ALBERS, J.A., STOCKMAN, N.O. ; NASA, CLEVELAND, OHIO, USA
TRANS. ASME SER. A (USA) VOL.97, NO.1 1-10 JAN. 1975 CODEN: JEPOA8
DESCRIPTORS: AIRCRAFT ENGINES, FLOW OF GASES, VISCOUS FLOW
IDENTIFIERS: COMPUTER PROGRAM SYSTEM, POTENTIAL, SOLUTIONS, ENGINE INLETS, CALCULATIONS, SUBSONIC CONVENTIONAL, AIRCRAFT ENGINE NACELLES, COMPRESSIBLE VISCOUS FLOW, DESIGN, ANALYSIS, VTOL LIFT FANS, ACOUSTIC SPLITTERS, STOL
SECTION CLASS CODES: D5420, D3510
(23 REFS)

29378 D7506743
SIGMA COMPUTER-CONTROLLED MACHINE INSPECTS CYLINDER BLOCKS AT RATE OF 35/H
MACH. AND PROD. ENG. (GB) VOL.126, NO.3254 365-7 16 APRIL 1975
CODEN: MPREAU
DESCRIPTORS: INTERNAL COMBUSTION ENGINE COMPONENTS, INSPECTION, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SIGMA 3-STATION COMPUTER CONTROLLED INSPECTION MACHINE, CHECKING, CYLINDER BLOCKS, DIESEL ENGINES, GAUGING STATION
SECTION CLASS CODES: D5410, D1370

28761 D7506126
(DIESEL) ENGINE TEST BED MODEL FOR DYNAMIC CONTROL STUDIES
AL-BERMANI, S.A., GRAVESTOCK, R.E. ; QUEEN MARY COLL., LONDON, ENGLAND
J. AUTOMOT. ENG. (GB) VOL.6, NO.1 10-15 FEB. 1975 CODEN: JAUEA9
DESCRIPTORS: DIESEL ENGINES, TEST FACILITIES, DYNAMICS, TORQUE
IDENTIFIERS: DYNAMIC CONTROL, ANALOGUE COMPUTER MODEL, DIESEL ENGINE , EDDY CURRENT DYNAMOMETER TEST BED, STEADY STATE, DYNAMIC TORQUE FUNCTIONS, SPEED CONTROLLER, TRANSFER FUNCTION, THROTTLE ACTUATOR
SECTION CLASS CODES: D5410, D1370
(6 REFS)

24210 D7501575
NEW APPLICATIONS OF THE SPARK-EROSION TECHNIQUE TO MACHINING
JANICKE, J. ; CHARMILLES S.A., GENEVA, SWITZERLAND
; GENERAL DELEGATION TO SCI. AND TECH. RES., ET AL
4TH JOURNEES DE PRINTEMPS DE LA MECANIQUE INDUSTRIELLE. (4TH SPRING CONFERENCE ON INDUSTRIAL MACHINERY) 6PP. 1974
I 22-24 APRIL 1974 GENERAL DELEGATION TO SCI. AND TECH. RES., ET AL PARIS, FRANCE
PUBL: GROUPEMENT POUR L:ADVANCEMENT DE LA MECANIQUE INDUSTRIELLE SAINT-OUEN, FRANCE
DESCRIPTORS: ELECTRICAL DISCHARGE MACHINING, MACHINE TOOL CONTROL
IDENTIFIERS: MINI COMPUTER, NEW APPLICATIONS, MACHINING, FULLY AUTOMATED OPERATIONAL CONTROL, OIL, DIELECTRIC, WATER, SHORT PULSE SPARK GENERATOR, ELECTRODE SYSTEM, NUMERICAL CONTROL
SECTION CLASS CODES: D4450
LANGUAGE: FRENCH

24113 D7501478
SIMILARITY PARAMETER FOR SCALING DYNAMIC (PRESSURE) INLET DISTORTION
MOORE, M.T., LUEKE, J.E. ; GENERAL ELECTRIC CO., CINCINNATI, OHIO, USA
TRANS. ASME SER. B (USA) VOL.96, NO.3 795-800 AUG. 1974
CODEN: JEFIA8
DESCRIPTORS: PRESSURE, AERODYNAMICS
IDENTIFIERS: ANALOGUE FILTERING, SIMILARITY PARAMETER, SCALING DYNAMIC INLET DISTORTION, PRESSURE, DIGITAL AVERAGING, TURBINE ENGINE, AIRCRAFT
SECTION CLASS CODES: D3510
(4 REFS)

23333 D7500698
DIRECT METHOD FOR ANALYSIS OF BRANCHED TORSIONAL SYSTEMS
SHAIKH, N. ; MERCURY MARINE, FOND DU LAC, WIS., USA
TRANS. ASME SER. B (USA) VOL.96, NO.3 1006-9 AUG. 1974
CODEN: JEFIA8
DESCRIPTORS: TORSION, ENGINES, NUMERICAL ANALYSIS
IDENTIFIERS: DIRECT METHOD, ANALYSIS, BRANCHED TORSIONAL SYSTEMS, TRANSFER MATRICES, VIBRATIONS, JUNCTION, NATURAL FREQUENCIES, COMPUTER SOLUTIONS, COUPLED ENGINE INSTALLATIONS, TURBINES, RECIPROCATING, SCREW COMPRESSORS, MARINE, AUTO DIFFERENTIALS, GEARED INSTALLATIONS, HOLZER METHOD
SECTION CLASS CODES: D3110
(5 REFS)

23110 D7500475
WHAT:S NEW IN MOTORCYCLE ENGINEERING
COVINGTON, J.
AUTOMOT. ENG. (USA) VOL.82, NO.9 37-43 SEPT. 1974 CODEN: AVEGBI
DESCRIPTORS: DESIGN, SAFETY, POLLUTION, INTERNAL COMBUSTION ENGINES, MOTOR VEHICLE BRAKES, MOTOR VEHICLE SUSPENSION
IDENTIFIERS: WOBBLE, ANTI LOCK BRAKES, MOTORCYCLE TECHNOLOGY, ENGINE EFFICIENCY, OUTPUT, BRAKING, SAFETY FACTORS, SUSPENSION SYSTEMS, NOISE , EMISSIONS CONTROL, DESIGN, AUTOMOTIVE APPLICATIONS, COMPUTER, PREDICT, SPEED/TORQUE CHARACTERISTICS, AUTOMATED DESIGN
SECTION CLASS CODES: D6290, D5410, D1340

23055 D7500420
COMPUTER SIMULATION TUNES UP ENGINE (BLOCK MACHINING) LINE (FOR HEAVY DUTY TRUCKS)
HAWKINS, W.A.
METALWORK. PROD. (GB) VOL.118, NO.11 91-3 NOV. 1974 CODEN: MWPDAW
DESCRIPTORS: SIMULATION, TRANSFER LINES, PISTON ENGINES, MACHINING, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: COMPUTER SIMULATION, ENGINE BLOCK, MACHINING LINE, HEAVY DUTY TRUCK, TRANSFER LINE, BALANCING, DESIGN, IN PROCESS GAUGING , ADJUSTMENT, AUTOMATIC, DRILLING, TAPPING, V-8 CYLINDER LINE
SECTION CLASS CODES: D5410, D4400, D6720, D1360

23053 D7500418
INTERNAL COMBUSTION ENGINE INSTRUMENTATION FOR ON-LINE COMPUTER APPLICATIONS
CONNOR, W.A. ; UNIV. COLL., LONDON, ENGLAND
INT. J. MECH. ENG. EDUC. (GB) VOL.2, NO.4 1-8 OCT. 1974 CODEN: IMEEB3
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, INSTRUMENTS, ENGINEERING APPLICATIONS OF COMPUTERS, TESTING
IDENTIFIERS: ON LINE COMPUTER APPLICATIONS, INTERNAL COMBUSTION ENGINE INSTRUMENTATION, DIGITAL, TEST RIGS, PERFORMANCE DATA
SECTION CLASS CODES: D5410, D2440, D1370
(4 REFS)

22227 D7407221
METHOD OF CHARACTERISTIC PERFORMANCE CALCULATION OF JOURNAL BEARINGS UNDER DYNAMIC LOADING
NAKAGAWA, E. : ISHIKAWAJIMA-HARIMA HEAVY INDUSTRIES CO. LTD., TOKYO, JAPAN
ISHIKAWAJIMA-HARIMA ENG. REV. (JAPAN) VOL.14, NO.5 497-506 SEPT. 1974 CODEN: ISHGAV
DESCRIPTORS: JOURNAL BEARINGS, LOADING
IDENTIFIERS: CHARACTERISTIC PERFORMANCE CALCULATION, JOURNAL BEARINGS, DYNAMIC LOADING, DIGITAL COMPUTER METHOD, FLUID FILM PRESSURE, FORCE, FRICTION LOSSES, DIESEL ENGINE
SECTION CLASS CODES: D3610
LANGUAGE: JAPANESE
(2 REFS)

21798 D7406792
INTERNAL COMBUSTION ENGINE TESTING BY DIGITAL COMPUTERS
SOLIMAN, J.I. ; QUEEN MARY COLL., UNIV. LONDON, ENGLAND
J. AUTOMOT. ENG. (GB) VOL.5, NO.4 22-6 AUG. 1974 CODEN: JAUEA9
DESCRIPTORS: INTERNAL COMBUSTION ENGINES, TESTING, ENGINEERING PLICATIONS OF COMPUTERS
IDENTIFIERS: INTERNAL COMBUSTION ENGINE, TESTING, DIGITAL COMPUTERS
SECTION CLASS CODES: D5410, D1370

21176 D7406170
THE WORLD:S LONGEST CYLINDER BLOCK (MACHINE TOOL TRANSFER) LINE IS ON RUSSIAN FRONT
HOLLINGUM, J.
ENGINEER (GB) VOL.239 NO.6184 40-1, 44 19 SEPT. 1974 CODEN: ENGIAL
DESCRIPTORS: TRANSFER LINES, MACHINE TOOLS, INTERNAL COMBUSTION ENGINE COMPONENTS
IDENTIFIERS: INGERSOLL CYLINDER BLOCK TRANSFER LINE, RUSSIAN KAMA RIVER TRUCK PLANT, MACHINE TOOL, COMPUTER SIMULATION, REMOTE AUTOMATIC TOOL ADJUSTMENT
SECTION CLASS CODES: D5410, D4400

20082 D7405076
MATCHING ENGINE-GENERATOR SYSTEMS TO NUCLEAR CORE-SPRAY REQUIREMENTS
HARTUNG, E.C. ; GENERAL ELECTRIC CO., SAN JOSE, CALIF., USA
POWER ENG. (USA) VOL.78, NO.7 52-5 JULY 1974
DESCRIPTORS: COMPUTER AIDED DESIGN, NUCLEAR POWER STATIONS, ELECTRIC GENERATORS, DIESEL ENGINES
IDENTIFIERS: MATCH, DESIGN, COMPUTER ANALYSIS PROGRAM, PUMP MOTORS, COMPONENTS, GOVERNOR, EXCITATION SYSTEM, NUCLEAR CORE SPRAY, MOTOR, DIESEL ENGINE GENERATOR SYSTEMS
SECTION CLASS CODES: D8100, D1340

20001 D7404995
USER EXPERIENCE OF A COMPUTER BASED WATCHKEEPING AND CONTROL SYSTEM (IN A TRAWLER)
HATFIELD, M.
; INST. MARINE ENGRS., NAUTICAL INST
STD BOOK NO.: 0 900976 40 3
PRACTICAL EXPERIENCE WITH SHIPBOARD AUTOMATION 12-21 1974
6 MARCH 1974 INST. MARINE ENGRS., NAUTICAL INST ENGLAND
PUBL: MARINE MEDIA MANAGEMENT LONDON, ENGLAND
DESCRIPTORS: CARGO SHIPS, CONTROL SYSTEMS, ENGINEERING APPLICATIONS OF COMPUTERS, RELIABILITY, MONITORING
IDENTIFIERS: EXPERIENCE, COMPUTER BASED WATCHKEEPING, CONTROL SYSTEM , UNMANNED ENGINE ROOM EQUIPMENT, DISTANT WATER FREEZER TRAWLER CLASS, ELECTRONIC, RELIABILITY, FIXED LOGIC RELAY CONTROL CIRCUITS
SECTION CLASS CODES: D6510, D2490

19665 D7404799
EROSIVE PRODUCTION METHODS (WITH SPARK EROSION MACHINES) RATIONALISE PRODUCTION
LEISEDER, L.
MASCHINENMARKT (GERMANY) VOL.80, NO.60 1165-8 26 JULY 1974
CODEN: MAMKAK
DESCRIPTORS: EROSION, ELECTRICAL DISCHARGE MACHINING
IDENTIFIERS: MACHINES, SPARK EROSION, NUMERICALLY CONTROLLED, ERODER, STEEL, DIE, ACCURACY, DIGITAL POSITION INDICATION, PULSE GENERATOR, ADAPTIVE CONTROL SYSTEM, SURFACE ROUGHNESS, PORTAL TYPE, RATES
SECTION CLASS CODES: D4450
LANGUAGE: GERMAN
(2 REFS)

18587 D7403581
TORSIONAL RESPONSE OF INTERNAL COMBUSTION ENGINES
ESHLEMAN, R.L. ; IIT RES. INST., CHICAGO, ILL., USA
TRANS. ASME SER. B (USA) VOL.96, NO.2 441-9 MAY 1974 CODEN: JEFIAB
DESCRIPTORS: INTERNAL COMBUSTION ENGINE PERFORMANCE, SIMULATION, VIBRATIONS, TORSION
IDENTIFIERS: TORSIONAL RESPONSE, INTERNAL COMBUSTION ENGINES, DIGITAL SIMULATION TECHNIQUE, REFINED MATHEMATICAL MODEL, END ITEM POWER SHAFTS, NATURAL FREQUENCIES, MODE SHAPES, TORSIONAL MOTIONS, STRESSES, FOURIER SERIES EXPANSION, FORCING FUNCTIONS, GASOLINE ENGINE, DIESEL ENGINE, ENGINE PRESSURE CRANK ANGLE CURVE
SECTION CLASS CODES: D5410
(5 REFS)

17881 D7402875
PRESSURE CHANGES, DUE TO EMERGENCY ARRANGEMENT, IN THE HP-PART AND RE-HEATER OF A STEAM GENERATOR
LEITHNER, R.
BRENNST.-WAERME-KRAFT (BWK) (GERMANY) VOL.26, NO.6 249-57 JUNE 1974 CODEN: BRWKAY
DESCRIPTORS: BOILERS, PRESSURE, FLOW, ENGINEERING APPLICATIONS OF COMPUTERS, MODELLING
IDENTIFIERS: MODEL, STEAM GENERATOR, PRESSURE, CHANGES, ESTIMATE, CALCULATE, ANALOGOUS, DIGITAL, COMPUTER, REHEATER, MASS FLOW, HP PART
SECTION CLASS CODES: D5220
LANGUAGE: GERMAN
(9 REFS)

13567 D7406073
SIMULATION STUDY OF TRANSIENT PERFORMANCE MATCHING OF TURBOFAN ENGINE USING AN ANALOGUE COMPUTER TO EVALUATE ITS USEFULNESS AS DESIGN TOOL
ITOH, M., ISHIGAKI, T., SAGIYA, Y. ; ISHIKAWAJIMA-HARIMA HEAVY INDUSTRIES CO. LTD., TOKYO, JAPAN
; ASME
INTERNATIONAL CONFERENCE ON GAS TURBINES (PREPRINTS) 1-6 1974
31 MARCH - 4 APRIL 1974 ASME ZURICH, SWITZERLAND
PUBL: ASME NEW YORK, USA
DESCRIPTORS: TURBOPROP ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, PRODUCT DESIGN
IDENTIFIERS: SIMULATION STUDY, TRANSIENT PERFORMANCE MATCHING, TURBOFAN ENGINE, ANALOGUE COMPUTER, DYNAMIC RESPONSE, DESIGN TOOL
SECTION CLASS CODES: D5420, D1340

13459 D7405965
SPINDLE POSITIONING WITH A STEPPING MOTOR IN MULTI-SPINDLE AUTOMATIC LATHES
VAN DE LOO, P.
IND.-ANZ. (GERMANY) VOL.96, NO.25 543-8 22 MARCH 1974
DESCRIPTORS: LATHES, POSITION CONTROL, STEPPING MOTORS
IDENTIFIERS: SPINDLE POSITIONING, STEPPING MOTOR, AUTOMATIC LATHES, DIGITAL CONTROL, HALL EFFECT GENERATOR, ZEROING TRANSMITTER
SECTION CLASS CODES: D4410, D2450, D2210
LANGUAGE: GERMAN
(6 REFS)

12905 D7405411
CALCULATION PROCEDURES FOR POTENTIAL AND VISCOUS FLOW SOLUTIONS FOR (AIRCRAFT) ENGINE INLETS
ALBERS, J.A., STOCKMAN, N.O. ; NASA, CLEVELAND, OHIO, USA
; ASME
INTERNATIONAL CONFERENCE ON GAS TURBINES (PREPRINTS) 1-8 1974
31 MARCH - 4 APRIL 1974 ASME ZURICH, SWITZERLAND
PUBL: ASME NEW YORK, USA
DESCRIPTORS: AIRCRAFT ENGINES, VISCOUS FLOW, ENGINEERING APPLICATIONS OF COMPUTERS, COMPRESSIBLE FLOW
IDENTIFIERS: CALCULATION PROCEDURES, METHOD, BASIC ELEMENTS, COMPUTER SOLUTIONS, POTENTIAL FLOW, ENGINE INLETS, SUBSONIC CONVENTIONAL, CTOL, STOL, VERTICAL TAKEOFF, VTOL, AIRCRAFT, NACELLES, COMPRESSIBLE VISCOUS FLOW, MEASURED SURFACE PRESSURE DISTRIBUTIONS, MODEL INLETS, PROGRAM, DESIGN, ANALYSIS, LIFT FANS, ACOUSTIC SPLITTERS , COMFYN, VISCUS, SHORT HAUL
SECTION CLASS CODES: D5420, D3510
(23 REFS)

16677 D7403133
AUTOMATING ENGINE AND EMISSION TESTING
AUTOMOT. ENG. (USA) VOL.81, NO.12 25-33 DEC. 1973 CODEN: AVEGBI
DESCRIPTORS: ENGINES, AUTOMATIC TESTING, ENGINEERING APPLICATIONS OF COMPUTERS, EXHAUST GASES
IDENTIFIERS: COMPUTER CONTROL, ENGINE TESTING, TESTING FLEXIBILITY, REDUCES DOWNTIME, SAVES TECHNICAL MANPOWER, EMISSION TESTING
SECTION CLASS CODES: D5400, D7831

9494 D7402000
COMPUTER-ASSISTED CALCULATION OF STRENGTH (USING FINITE ELEMENT METHOD)
BUCK, K.E., WINKLER, K. ; BROWN BOVERI, HEMSBACH, GERMANY
BBC NACHR. (GERMANY) VOL.55, NO.12 410-17 1973 CODEN: BBCNAZ
DESCRIPTORS: COMPUTER-AIDED DESIGN, FINITE ELEMENT METHOD, MECHANICAL STRENGTH
IDENTIFIERS: STRENGTH, FINITE ELEMENTS, STRUCTURES, TILTING ARM, CORELESS INDUCTION FURNACE, GENERATOR, RADIATOR CASING, TURBINE FOUNDATION, COMPUTER ASSISTED CALCULATION
SECTION CLASS CODES: D1340, D3260
(3 REFS)

6683 D7306683
SIMULATION OF THERMODYNAMIC PROCESS OF A DIESEL ENGINE ON A SMALL DIGITAL COMPUTER
OJHA, V.P. ; DIESEL LOCOMOTIVE WORKS, VARANASI, INDIA
J. INST. ENG. (INDIA) MECH. ENG. DIV. VOL.53, NO. ME 6 292-301 JULY 1973 CODEN: JEMDAS
DESCRIPTORS: DIESEL ENGINES, THERMODYNAMICS, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: SIMULATION, SMALL DIGITAL COMPUTER, MATHEMATICAL MODEL, THERMODYNAMIC PROCESS, DIESEL ENGINE
SECTION CLASS CODES: D5410, D5100
(11 REFS)

5472 D7305472
THE USE OF A HYBRID COMPUTER IN THE OPTIMISATION OF GAS TURBINE (TURBOJET ENGINE THRUST RESPONSE) CONTROL PARAMETERS
SARAVANAMUTTOO, H.I.H., MACISAAC, B.D. ; CARLETON UNIV., OTTAWA, CANADA
TRANS. ASME SER. A (USA) VOL.95, NO.3 257-64 JULY 1973 CODEN: JETOAB
DESCRIPTORS: OPTIMISATION, GAS TURBINES, TURBOJET ENGINES, SIMULATION, COMPUTER APPLICATIONS
IDENTIFIERS: OPTIMISATION, GAS TURBINE, HYBRID COMPUTER, TURBOJET ENGINE, COMPRESSOR, THERMODYNAMICS, SIMULATION, THRUST RESPONSE, CONTROL SYSTEM, ACCELERATION TRAJECTORY
SECTION CLASS CODES: D5420
(6 REFS)

5466 D7305466
GENERAL APPROACH TO THE COMPUTER SOLUTION OF SINGLE- AND TWO-STAGE TURBOCHARGED DIESEL ENGINE MATCHING
WALLACE, F.J., CAVE, P.R. ; UNIV. BATH, ENGLAND
PROC. INST. MECH. ENG. (GB) VOL.187, NO.48 535-47 1973
CODEN: PIMLAA
DESCRIPTORS: DIESEL ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS
IDENTIFIERS: COMPUTER SOLUTION, TURBOCHARGED DIESEL ENGINE MATCHING
SECTION CLASS CODES: D5410
(28 REFS)

4897 D7304897
:THORSHOLM:-FIRST SHIP WITH DATACHIEF (COMPUTER CONTROL ENGINE ROOM)
SHIPBUILD. AND MAR. ENG. INT. (GB) VOL.96, NO.1169 652-3 AUG. 1973
DESCRIPTORS: MARINE ENGINES, CARGO SHIPS, COMPUTER APPLICATIONS
IDENTIFIERS: 280000 TDW TANKER, MONITORING, ENGINE OPERATION, PERFORMANCE, MERCHANT SHIP, COMPUTER CONTROL ENGINE ROOM
SECTION CLASS CODES: D6510, D5410

424 D7300424
DIGITAL SIMULATION OF ROTARY PISTON ENGINES (OR WANKEL ENGINE)
LAWTON, B., MILLAR, D.H., HUTCHINSON, D.P. ; ROYAL MILITARY COLL. SCI., SWINDON, ENGLAND
; INSTN. MECH. ENGRS. ET. AL
CONFERENCE ON ENGINE PERFORMANCE MODELLING 25-32 1973
22-23 MAY 1973 INSTN. MECH. ENGRS. ET. AL LONDON, ENGLAND
PUBL: INSTN. MECH. ENGRS. LONDON, ENGLAND
DESCRIPTORS: WANKEL ENGINES, ROTARY ENGINES, ENGINEERING APPLICATIONS OF COMPUTERS, MODELLING
IDENTIFIERS: DIGITAL SIMULATION, ROTARY PISTON ENGINES, WANKEL ENGINE, SPARK IGNITION, COMPRESSION IGNITION, MODELLING, THERMODYNAMIC CYCLE
SECTION CLASS CODES: D5410
(10 REFS)

421 D7300421
THE COMPUTER MODELLING OF :LARGE: MECHANICAL SYSTEMS-DYNAMIC AND KINEMATIC ANALYSIS (OF V-8 ENGINE)
TIMM, R.F., LARSON, C.S., NAGAMATSU, R.R. ; MICHIGAN TECHNOL. UNIV., HOUGHTON, USA
; INSTN. MECH. ENGRS
STD BOOK NO.: 0 85298 196 1
MECHANISMS 1972 CONFERENCE 111-16 1973
5-6 SEPT. 1972 INSTN. MECH. ENGRS LONDON, ENGLAND
PUBL: INSTN. MECH. ENGRS. LONDON, ENGLAND
DESCRIPTORS: KINEMATICS, DYNAMICS, MODELLING, INTERNAL COMBUSTION ENGINES, COMPUTER-AIDED DESIGN
IDENTIFIERS: COMPUTER MODELLING, DYNAMIC AND KINEMATIC ANALYSIS, RIGID BODY SYSTEM, INTERNAL COMBUSTION ENGINE
SECTION CLASS CODES: D5410
(17 REFS)

62 D7300062
PULSE-COUNTING SIGNAL SYSTEMS FOR N.C
PESCHANSKII, B.I.
STANKI AND INSTRUM. (USSR) NO.12 11-12 1972 CODEN: STINA4
TRANS OF: MACH. AND TOOL. (GB) NO.12 15-18 1972 CODEN: MCTOAD
DESCRIPTORS: NUMERICAL CONTROL, DISPLAY INSTRUMENTS
IDENTIFIERS: DIGITAL DISPLAY, PRODUCES, ANALYZES, ALGORITHMS, CALCULATING, VARIOUS SYSTEMS, DESIGN, CIRCUIT, START STOP GENERATOR, PULSE COUNTING SIGNAL SYSTEMS, NC, MULTI DIGIT COUNTERS, MACHINE TOOLS
SECTION CLASS CODES: D2440, D4400
(2 REFS)

ASSEMBLY LANGUAGE PROGRAM
TO IMPLEMENT BANG-BANG REGULATION TECHNIQUES

```
                                * AP23,24,25 JUNE 15,1976
                                * START FROM ZERO
00000                00000            REL     0
00000  00001         00001      UP    BSS     1,1
00001  XXXXX         00235      ADVOR ADR     VORD
00002  00000         00000      LIN   BSS     1,0
00003  XXXXX         00112      ADLP3 ADR     LP3
00004  XXXXX         00012      ADLP1 ADR     LP1
00005  XXXXX         00073      ADLP2 ADR     LP2
00006  00001         00001      DGTL  BSS     1,1
00007  00001         00001      ONE   BSS     1,1
00010   26740                         CLR
00011  161771        00002            STA     LIN
00012   65222        00234      LP1   L,I     ADCNI
00013   65132        00145            L,I     CONR
00014   61136        00152            L       REFRD
00015   65764        00001            L,I     ADVOR
00016  141762        00000            LA      UP
00017   20200                         OCA
00020   24100                         SAE
00021   45127        00150            J,I     ADWN
00022  141154        00176            LA      REF
00023  175124        00147            S,I     ADBP
00024  121151        00175            C       VO
00025   27414                         SLE
00026   41764        00012            J       LP1
00027  141147        00175            LA      REF
00030  121145        00175            C       VO
00031   27412                         SGE
00032   45116        00150            J,I     ADWN
00033  141751        00004            LA      ADLP1
00034  161177        00233            STA     POINT
00035  141112        00147            LA      ADBP
00036   20040                         AOA
00037  121165        00224            C       ADDUM
00040   27404                         SL
00041   55125        00146            L,I     ADLCN
00042   71105        00147            AOM     ADBP
00043   71105        00151            AOM     ADGCN
00044   65101        00145            L,I     CONR
00045   26740                         CLR
00046  161734        00002            STA     LIN
00047   41743        00012            J       LP1
00050   26740                   DWN   CLR
00051  161727        00000            STA     UP
00052  141124        00176            LA      REF
00053  155074        00147            A,I     ADBP
00054  121121        00175            C       VO

0
00055   27404                         SL
00056   41004        00062            J       *+4
00057   26740                         CLR
00060  161722        00002            STA     LIN
00061   41012        00073            J       LP2
00062  141722        00004            LA      ADLP1
00063  161150        00233            STA     POINT
00064  141063        00147            LA      ADBP
00065   20040                         AOA
00066  121135        00224            C       ADDUM
```

```
00067   27404                  SL
00070   65056  00146           L,I     ADLCN
00071   26740                  CLR
00072  161710  00002           STA     LIN
00073  141056  00151   LP2     LA      ADCON
00074  171713  00007           S       ONE
00075  121127  00224           C       ADDUM
00076   27402                  SG
00077   41012  00111           J       XX
00100  161051  00151           STA     ADCON
00101  141046  00147           LA      ADBP
00102  171705  00007           S       ONE
00103  161044  00147           STA     ADBP
00104  145043  00147           LA,I    ADBP
00105  151071  00176           A       REF
00106  121067  00175           C       VO
00107   27412                  SGE
00110   41763  00073           J       LP2
00111   61142  00253   XX      L       CONO
00112   61040  00152   LP3     L       REFRD
00113   61122  00235           L       VORD
00114  141062  00176           LA      REF
00115  155032  00147           A,I     ADBP
00116  125054  00172           C,I     ADVO
00117   27402                  SG
00120   41772  00112           J       LP3
00121  141055  00176           LA      REF
00122  121053  00175           C       VO
00123   27402                  SG
00124   41004  00130           J       *+4
00125   20000                  CAO
00126  161052  00000           STA     UP
00127   41223  00352           J       LP4
00130  141053  00003           LA      ADLP3
00131  161102  00233           STA     POINT
00132  141015  00147           LA      ADBP
00133   20040                  AOA
00134  121070  00224           C       ADDUM

00135   27404                  SL
00136   65010  00146           L,I     ADLCN
00137   26740                  CLR
00140  161642  00002           STA     LIN
00141   71006  00147           AOM     ADBP
00142   71007  00151           AOM     ADCON
00143   61110  00253           L       CONO
00144   41746  00112           J       LP3
00145   XXXXX  00253   CONR    ADR     CONO
00146   XXXXX  00406   ADLCN   ADR     LCNT
00147   XXXXX  00177   ADBP    ADR     BREAK
00150   XXXXX  00050   ADWN    ADR     DWN
00151   XXXXX  00212   ADCON   ADR     CTRL
                     * READ REFERENCE VOLTAGE
00152   00000  00000   REFRD   ADR     0
00153  141020  00173           LA      GAIN
00154   35270  00070           SR      '70
00155   24070  00070           SI      '70
00156  131013  00171           AND     MASK
00157   27407                  SNZ
```

```
00150  41775 00155          J       *-3
00151  02070 00070          DI      '70
00152  26250 00010          LRS     '10
00153  20103                TCA
00154  26210 00010          LLS     '10
00155  26250 00010          LRS     '10
00156 161010 00176          STA     REF
00157  45763 00152          J,I     REFRD
00170  [illegible]   RFVOL  BSS     1,0
00171  40000 40000   MASK   BSS     1,'40000
00172  XXXXX 00175   ADVO   ADR     VO
00173  00000 00000   GAIN   BSS     1,0
[illegible]          NMBR   DEC     10
00175  00000 00000   VO     BSS     1,0
[illegible]          REF    BSS     1,0
[illegible]          BREAK  BSS     10,0
00211  [illegible] 00000   SUM    BSS     1,0
[illegible]          [illegible]  BSS  1,0
00224  XXXXX 00211   ADDUM  ADR     SUM
00225  XXXXX 00212   AUP    ADR     UP
00226  XXXXX 00012   ALP1   ADR     LP1
00227  XXXXX 00002   ALIN   ADR     LIN
00230  XXXXX 00233   APNT   ADR     POINT
00231  XXXXX 00176   AREF   ADR     REF
00232  XXXXX 00006   ADGTL  ADR     DGTL
00233  00000 00000   POINT  ADR     0
00234  XXXXX 00372   ADCNI  ADR     CONI
                   * READ OUTPUT VOLTAGE + COMPARE
00235  00000 00000   VORD   ADR     0
00236 141014 00252          LA      VOGN
00237  05070 00070          DF      '70
00240  04070 00070          SI      '70
00241 131730 00171          AND     MASK
00242  27407                SNZ
00243  41775 00240          J       *-3
00244  02070 00070          DI      '70
00245  26250 00010          LRS     '10
00246  20103                TCA
00247  26210 00010          LLS     '10
00250 161725 00175          STA     VO
00251  45764 00235          J,I     VORD
00252  00001 00001   VOGN   BSS     1,1
                   * OUTPUT CONTROL WORD
00253  00000 00000   CONO   ADR     0
00254 141046 00322          LA      CHAN
00255  05076 00076          DF      '76
00256 145754 00232          LA,I    ADGTL
00257 121530 00007          C       ONE
00260  27406                SNE
00261  41003 00264          J       *+3
00262 141122 00404          LA      ANA
00263  41013 00276          J       OUT
00264 141514 00000          LA      UP
00265 121522 00007          C       ONE
00266  27414                SE
00267  41004 00273          J       *+4
00270 145651 00151          LA,I    ADCON
00271  26210 00010          LLS     '10
```

```
00272  41004 00276                J      OUT
00273 145656 00151                LA,I   ADCON
00274  20100                      TCA
00275  26210 00010                LLS    '10
00276  23500        OUT           SSW    B
00277  41007 00306                J      ROUT
00300  61072 00372                L      CON1
00301 141103 00404                LA     ANA
00302  03076 00076                DO     '76
00303 141504 00007                LA     ONE
00304  05076 00076                DF     '76
00305  26740                      CLR
00306  03076 00076  ROUT          DO     '76
00307 141500 00007                LA     ONE
00310  05076 00076                DF     '76
00311 145721 00232                LA,I   ADGTL
00312 121475 00007                C      ONE
00313  27410                      SE
00314  41003 00317                J      *+3
00315 141067 00404                LA     ANA
00316  41002 00320                J      *+2
00317  26740                      CLR
00320  03076 00076                DO     '76
00321  45732 00253                J,I    CONO
00322  00000 00000  CHAN          BSS    1/0
00323  XXXXX 00007  ADONE         ADR    ONE
                    * NOW UNDER LINEAR CONTROL
00324  27400        IDLE          NOP
00325  61045 00372                LA     CON1
00326  61725 00253                LA     CONO
00327  61623 00152                L      REFRD
00330  61735 00235                L      VORD
00331 141645 00176                LA     REF

00332 155615 00147                A,L    ADBP
00333 121642 00175                C      VO
00334  27402                      SG
00335  41002 00337                J      *+2
00336  41004 00342                J      *+4
00337  20000                      CAO
00340 161446 00006                STA    DGTL
00341  41507 00050                J      DWN
00342 141634 00176                LA     REF
00343 175604 00147                S,I    ADBP
00344 121631 00175                C      VO
00345  27402                      SG
00346  41756 00324                J      IDLE
00347  20000                      CAO
00350 161436 00006                STA    DGTL
00351 165654 00225                STA,I  AUP
00352 141577 00151  LP4           LA     ADCON
00353 175750 00323                S,I    ADONE
00354 121550 00224                C      ADDUM
00355  27402                      SG
00356  41012 00372                J      YY
00357 161572 00151                STA    ADCON
00360 141567 00147                LA     ADBP
00361 175742 00323                S,I    AONE

00362 161555 00147                STA    ADBP
```

```
33363 141613 30176            LA        REF
33364 175563 30147            S,I       ADBP

00365 121010 00175            C         V0
00365  27404                  SL
00367  41763 00352            J         LP4
00370  45636 00226      YY    J,I       ALP1
00371  XXXXX 00175      AVO   ADR       V0
                   * READ IN LINEAR CONTROL
00372  00000 00000      CONI  ADR       0
00373 141012 00405            LA        LNGN
00374  05070 00070            DF        '70
00375  24070 00070            SI        '70
00376 131573 00171            AND       MASK
00377  27407                  SNZ
00400  41775 00375            J         *-3
00401  02070 00070            DI        '70
00402 161002 00404            STA       ANA
00403  45767 00372            J,I       CONI
00404  00000 00000      ANA   BSS       1,0
00405  00002 00002      LNGN  BSS       1,2
                   * DETERMINES IF SYSTEM READY FOR LINEAR CONTROL

00406  00000 00000      LCNT  ADR       0
00407  75620 00227            AOM,I     ALIN
00410 145617 00227            LA,I      ALIN
00411 121036 00417            C         GOLN
00412  27412                  SGE
00413  45620 00233            J,I       POINT
00414  26740                  CLR
00415 165615 00232            STA,I     ADGTL
00416  41706 00324            J         IDLE
00417  00005            GOLN  DEC       5
             00000            END       0
```

STUDY OF EFFECT OF LOWER MAIN FIELD TIME CONSTANTS

The time constant of the main field and the exciter field are associated with the lowest frequency band of the alternator control spectrum. In view of this the main field time constant was changed from 0.133 seconds to 0.364 seconds to determine the effect on control stability. The gain was adjusted to provide the same bandwidth of 20 Hz as shown in the curve of M, in Figure 4-12.

The results of the change in time constant are noted in the curve of M_1 where the peak at 11 Hz is slightly higher when no compensation issued. Using the same compensation (lead at 3.3 Hz and lag at 13.3 Hz) as used for M_2 of Figure 4-12, we find that the characteristic of M_2 in D-1 is flat within 0.5 db out to 20 Hz. Optimization of the compensation could improve this characteristic.

Figure D-2 shows the transfer of open loop to closed loop for the main field time constant of .364 and an open loop gain of 57 db/S as plotted on a Nichols Chart. This gain would provide about an 11 Hz bandwidth for the uncompensated case. Increase of gain to 64 db/S provides the closed loop characteristic recorded in M_1 of Figure D-1. The compensated case has the desired gain (57 db/S) as shown and produces the closed loop characteristic shown as M_2 in Figure D-2.

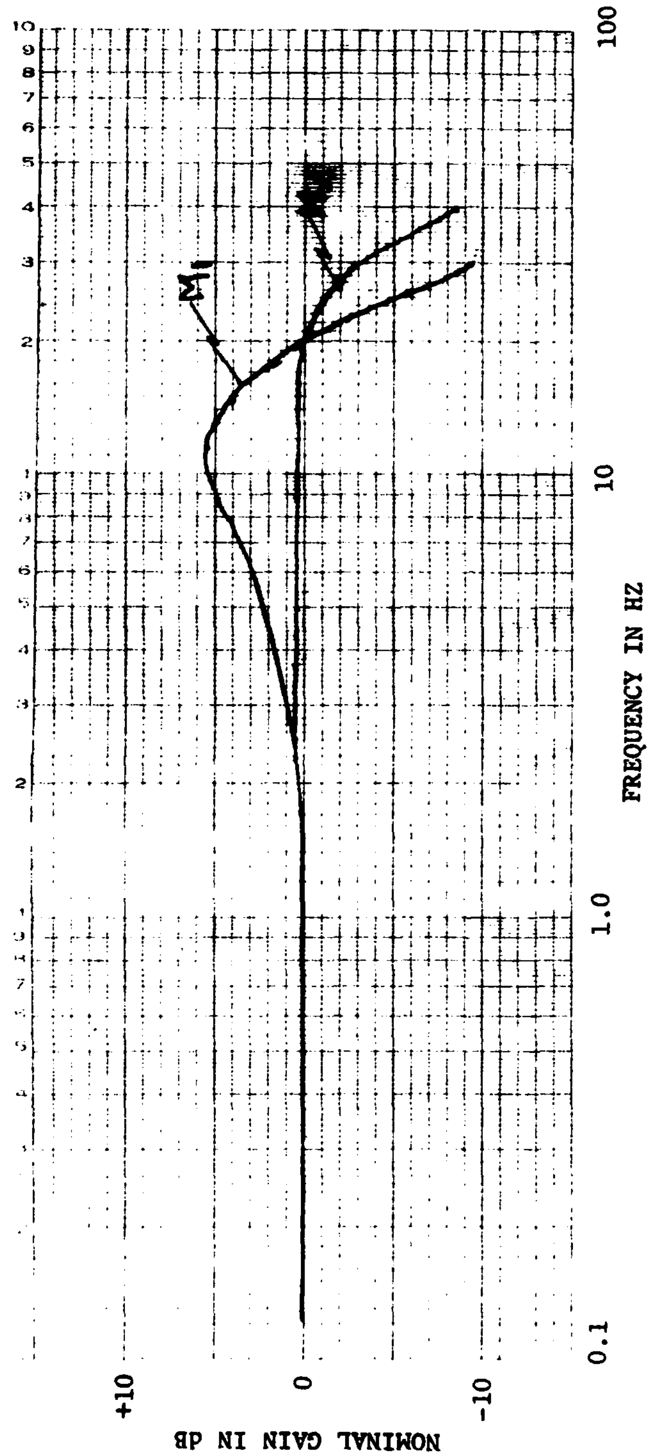


Figure D-1. Alternator Voltage Control
Closed Loop Frequency Response
M_1 - Without Compensation
M_2 - With Compensation

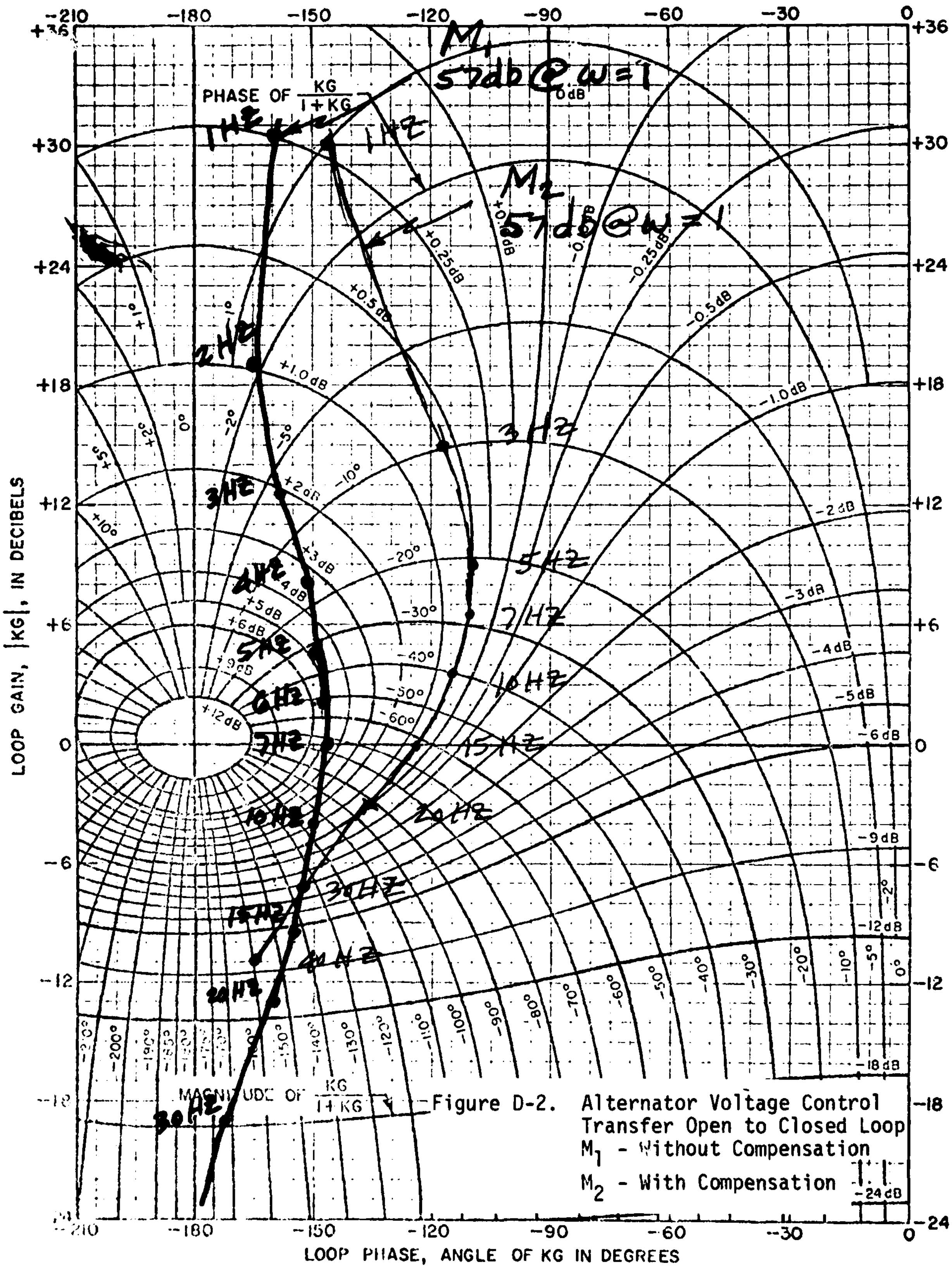
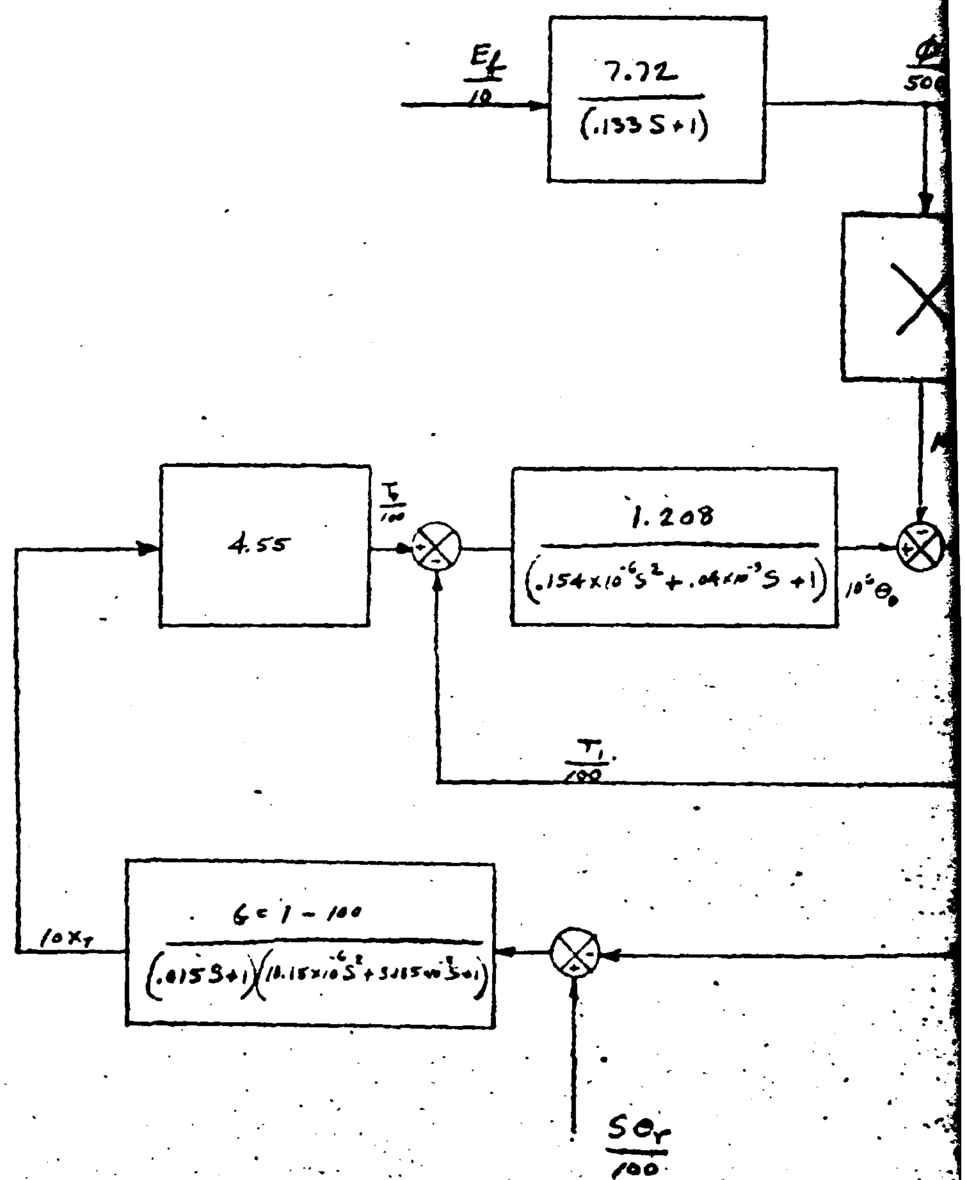
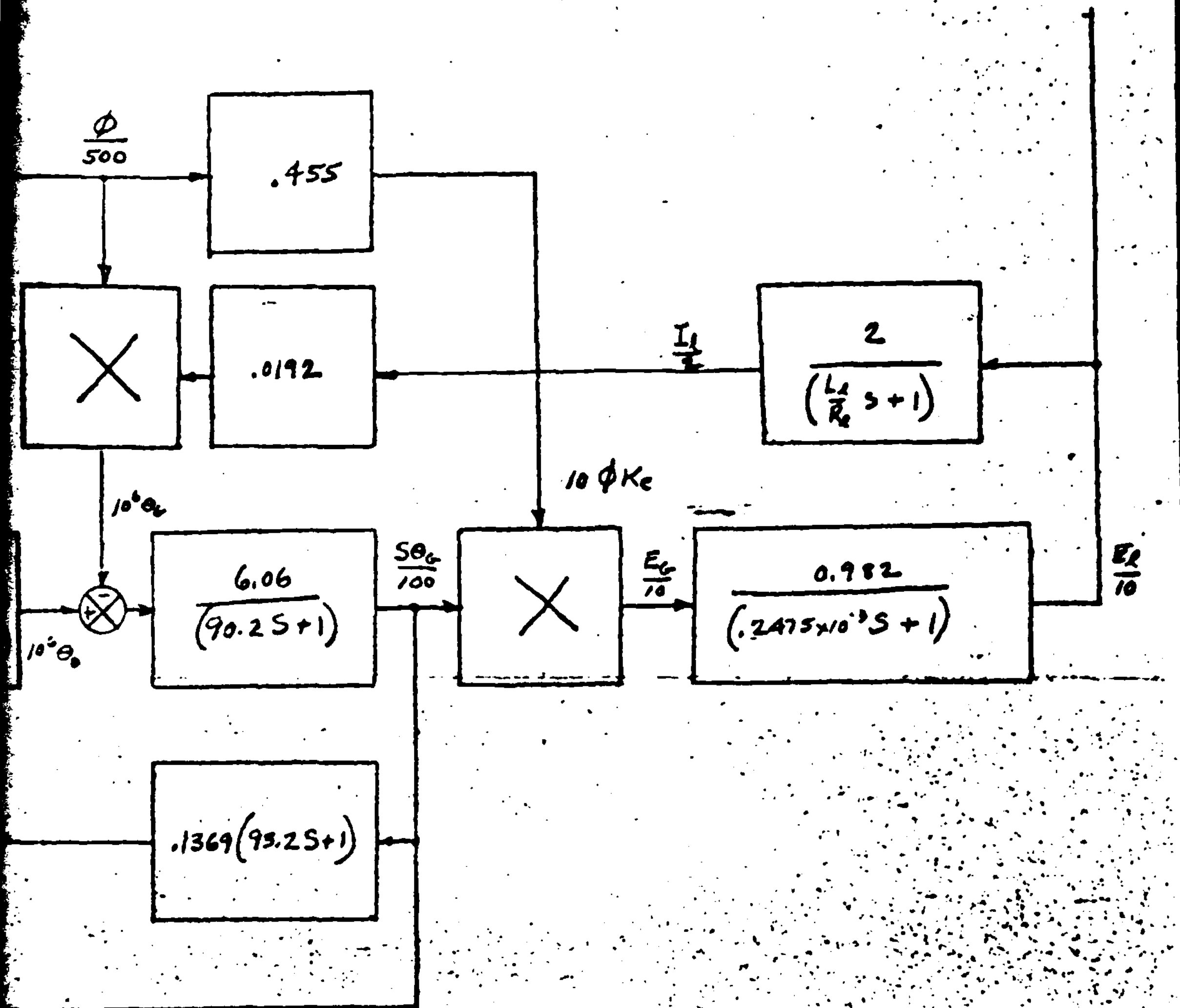


Figure D-2. Alternator Voltage Control Transfer Open to Closed Loop
M_1 - Without Compensation
M_2 - With Compensation



$\frac{E_f}{10}$
7.72 / (.133 S+1)
1.208 / (.154×10⁻⁶S² + .04×10⁻³S + 1)
4.55
$\frac{T_1}{100}$
$10^5\theta_0$
6 = 1 - 100
(.015 S+1)(10.15×10⁻⁶S² + 3.115×10⁻³S+1)
$10X_T$
$\frac{50_r}{100}$



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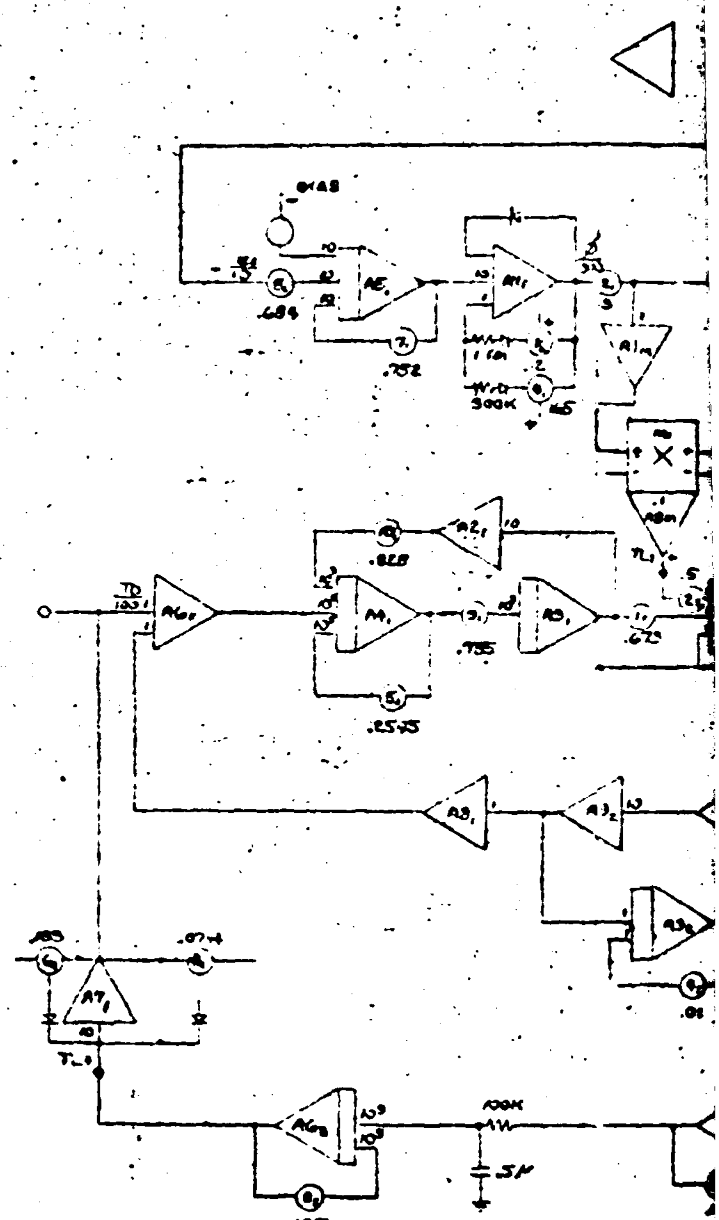
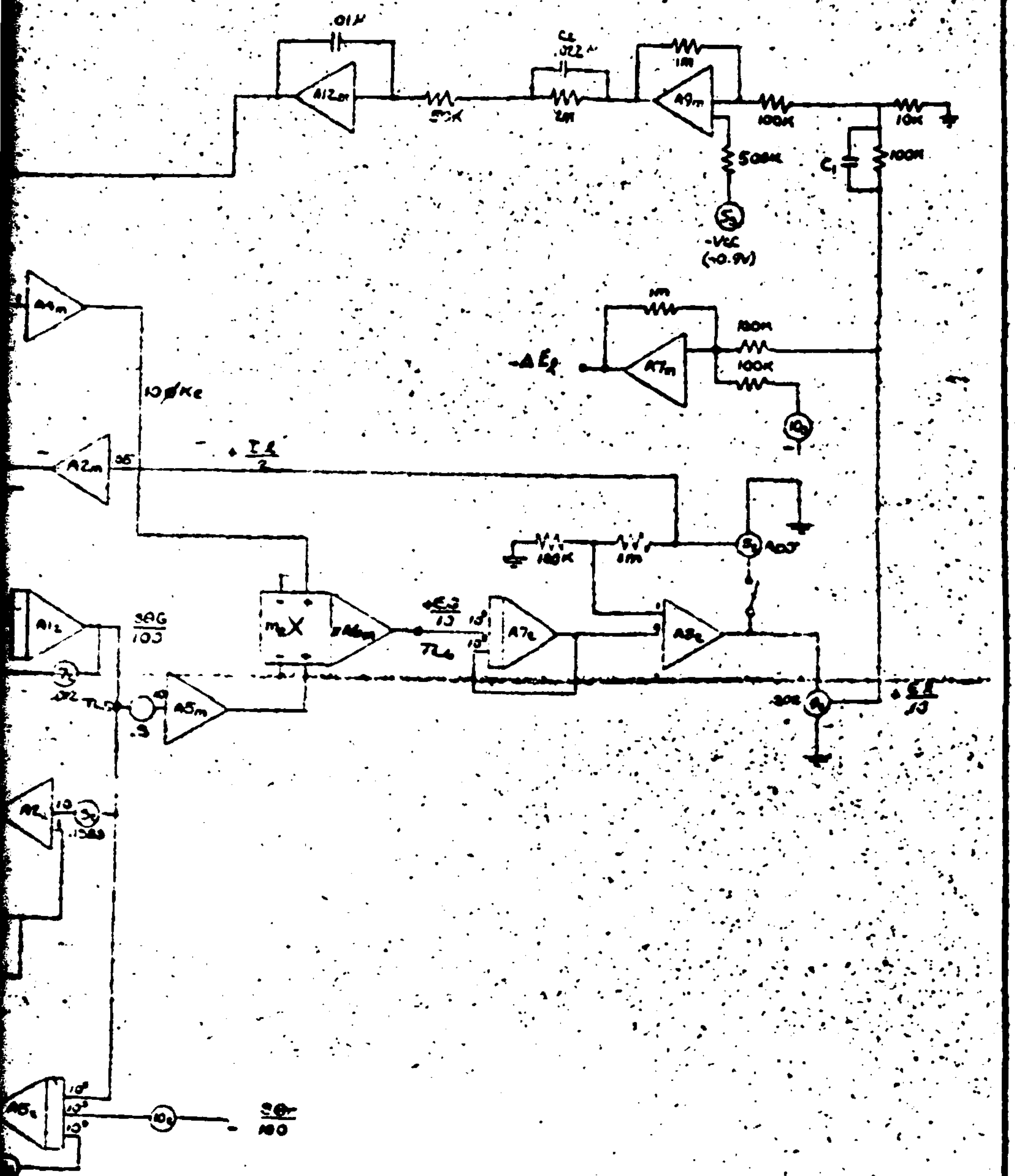
TITLE: AC-APU DYNAMICS BLOCK DIAGRAM

C4258-06

2



214A (A-203 of A-20



REV NO.	DATE	DESCRIPTION	REV'D BY	CHK'D BY

THE FRANKLIN INSTITUTE RESEARCH LABORATORIES

THE BENJAMIN FRANKLIN PARKWAY • PHILADELPHIA, PENNSYLVANIA 19103

TITLE AC-APU ANALOG COMPUTER PROGRAM

TOLERANCES UNLESS OTHERWISE NOTED	DRAWN JDS	DATE	SCALE	MATERIAL
REMOVE BURRS, SHARP EDGES	CHECKED J. STONE	DATE	APP'VD 3/24/76 DATE	REFERENCE C4258-06
	DWG. NO.			

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1

APPENDIX B

MICROCOMPUTER CONTROL SYSTEM SOFTWARE

B-1. BRIEF DISCUSSION ON TYPES OF CONTROL

Three types of control are ordinarily considered:

1. Proportional

   $K_P e$

   where e = desired value - actual value

2. Integral

   $K_I \int_0^t e\, dt$

3. Derivative

   $K_D \frac{de}{dt}$

Proportional control is always desireable. Integral control is used when the steady state error must be small since the integral control signal will grow indefinitely for any error however small. However, too much integral control may lead to instability especially if there are large time delays in the response of the system. Derivative control tends to stabilize the system and to offset time delays.

In the voltage control system, the specifications require a small steady state error, therefore integral control is necessary. The time delays mainly in the exciter and generator field circuits are relatively small and it was possible to stabilize the system without derivative control. Therefore, in the voltage control system, the control function consists of integral plus proportional control. The control signal = $K_P e + K_I \int_0^t e\, dt$.

The specifications for speed control do not require as small a steady error as in voltage control. Therefore, integral control isn't necessary. The system time delays mainly due to the generator and engine inertias are large and derivative control helps to stabilize the system. Therefore, the speed (frequency) control system consists of proportional plus derivative control. The control signal = $K_P e + K_D \frac{de}{dt}$. Integral control was tried in the frequency control system. However, even a small amount of integral control tended to make the system oscillate, so the best performance was obtained with no integral control.

B-2. EQUATIONS RELATING TO DEVELOPMENT OF VOLTAGE CONTROL ALGORITHM

Vg = Generator voltage in RMS volts

$K_1 Vg$ = d-c voltage after rectification where K_1 is dependent on potentiometer R30 (Three Phase Voltage to Analog Switch Circuit

I_f = field current

$K_1 Vdes$ = d-c reference voltage (created by -12 V through circuitry consisting of R4, D1, D2, R3, and potentiometer R1 in Three Phase Voltage to Analog Switch Circuit)

$Vg = Kg I_f$ Generator Equation (1)
where: Kg = slope of generator air gap line

$Ee_x = R_f I_f + L_f \frac{dI_f}{dt}$ Main Field Equation (2)

$Vc = Rex\ Iex + Lex \frac{dIex}{dt}$ Rotary Exciter Equation (3)

$Eex = Kex\ Iex$ = Voltage applied to main field by rotary exciter (4)
where: Kex = slope of exciter saturation curve

R_f = Main field resistance

L_f = Main field inductance

Vc = Voltage from computer

Iex= Rotary Exciter field current

Rex= Rotary Exciter field resistance

Lex= Rotary Exciter Field inductance

$K_1(Vdes-Vg)$ = voltage to A to D converter

$$V_C = K_p K_1 (Vdes-Vg) + K_I \int_0^t K_1 (Vdes - Vg)dt = \quad (5)$$

Control equation (Proportional & Integral) where: Kp & K_I are parameters set in computer program.

Taking Laplace transformers of equations (1), (2), (3) & (4)

$$\underline{Vg} = Kg\ \underline{I_f} \quad (6)$$
$$\underline{Eex} = (R_f + sL_f)\ \underline{I_f} = R_f\ \underline{I_f}(1 + s\tau_f) \quad (7)$$
$$\underline{Vc} = (Rex + s\,Lex)\ \underline{Iex} = Rex\ \underline{Iex}(1 + s\tau_{ex}) \quad (8)$$
$$\underline{Vc} = K_1 \left(\frac{\underline{Vdes}}{s} - \underline{Vg}\right)\left[Kp + \frac{K_I}{s}\right] \quad (9)$$
$$\underline{Eex} = Kex\ \underline{Iex}$$

NOTE: The underscore under a quantity indicates Laplace transform

$$T_f = \frac{L_f}{R_f} \quad , \quad T_{ex} = \frac{L_{ex}}{R_{ex}}$$

$$\underline{V}_g = K_g\, \underline{I}_f = \frac{K_g\, E_{ex}}{R_f\,(1+sT_f)} = \frac{K_g\, K_{ex}\, \underline{V}_c}{R_{ex}\, R_f\,(1+sT_f)(1+sT_{ex})}$$

$$\underline{V}_g = \frac{K_g\, K_{ex}\, K_1 K_I \left[1 + \frac{K_p}{K_I} s\right]}{R_f\, R_{ex}\, s(1+sT_f)\,(1+sT_{ex})} \left(\frac{V_{des}}{s} - \underline{V}_g\right)$$

$$\underline{V}_g = \frac{K\left(1+\frac{K_p}{K_I} s\right)}{s(1+sT_f)(1+sT_{ex})} \left(\frac{V_{des}}{s} - \underline{V}_g\right)$$

$$\underline{V}_g = \frac{K\left(1+\frac{K_p}{K_I} s\right)}{s(1+sT_f)\,(1+sT_{ex}) + K\left(1+\frac{K_p}{K_I} s\right)} \quad \frac{V_{des}}{s} \tag{10}$$

Where: $K = \frac{K_g\, K_{ex}\, K_1 K_I}{R_f\, R_{ex}}$

To get steady state value of Vg apply final value theorem

$$V_g \text{ steady state} = \lim_{s \to 0} s\underline{V}_g$$

Vg steady state = Vdes as it should

If Kp & K_I are chosen such that

$$\frac{K_p}{K_I} = T_f$$

$$\underline{V}_g = \frac{K}{s(1+sT_{ex}) + K} \quad \frac{V_{des}}{s} \tag{11}$$

Equation (11) is equivalent to the differential equation

$$T_{ex} \frac{d^2V_g}{dt^2} + \frac{dV_g}{dt} + KV_g = K\, V_{des} \tag{12}$$

To model the effect of applying or removing load assume the machine is running in steady state with Vg = Vdes and Vdes is suddenly changed from Vdes to Vdes $+ \Delta V$.

Solving equation (12) with initial conditions:

$$t = o \quad , \; Vg = Vdes + \Delta V$$
$$\frac{dVg}{dt} = 0$$

Which gives rise to:

$$\underline{Vg} = \frac{Vdes + \Delta V}{s} - \frac{K}{s(Tex\ s+1)+K} \quad \frac{\Delta V}{s}$$

This corresponds to a sudden jump from Vdes to Vdes + ΔV followed by a decrease to Vdes governed by the time function corresponding to:

$$\frac{K}{s(Tex\ s+1)+K} \quad \frac{\Delta V}{s}$$

The time function is:

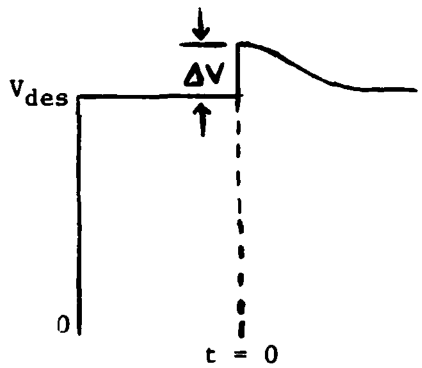
$$Vg = Vdes + \left(\frac{1-A}{2A} e^{-\alpha_1 t} - \frac{1+A}{2A} e^{-\alpha_2 t} \right) \Delta V$$

$$\text{Where:} \quad A = \frac{1}{Tex} \sqrt{1-4KTex}$$

$$\alpha_1 = \frac{1}{2Tex} (1+A)$$

$$\alpha_2 = \frac{1}{2Tex} (1-A)$$

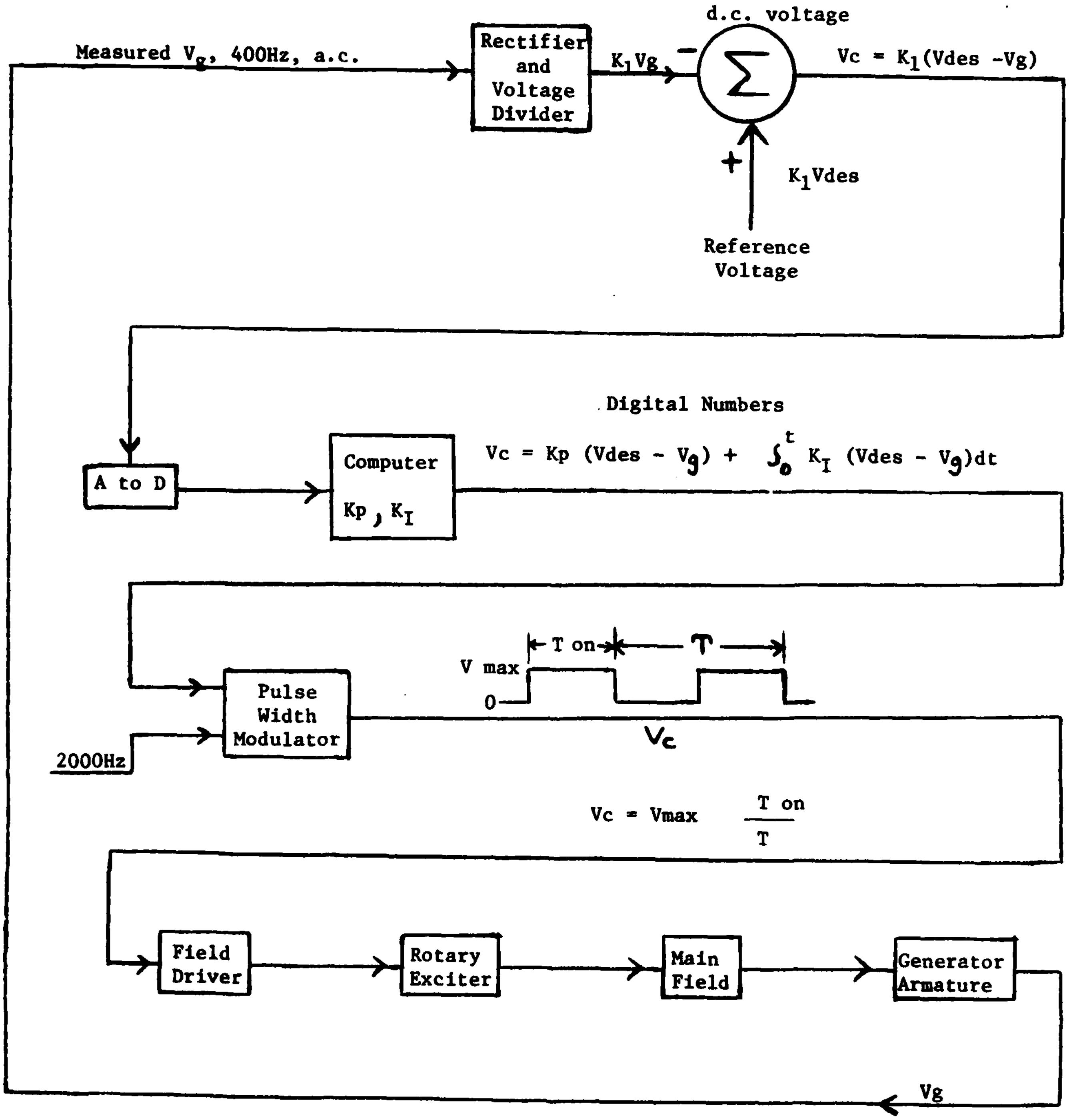
A sketch of Vg is:



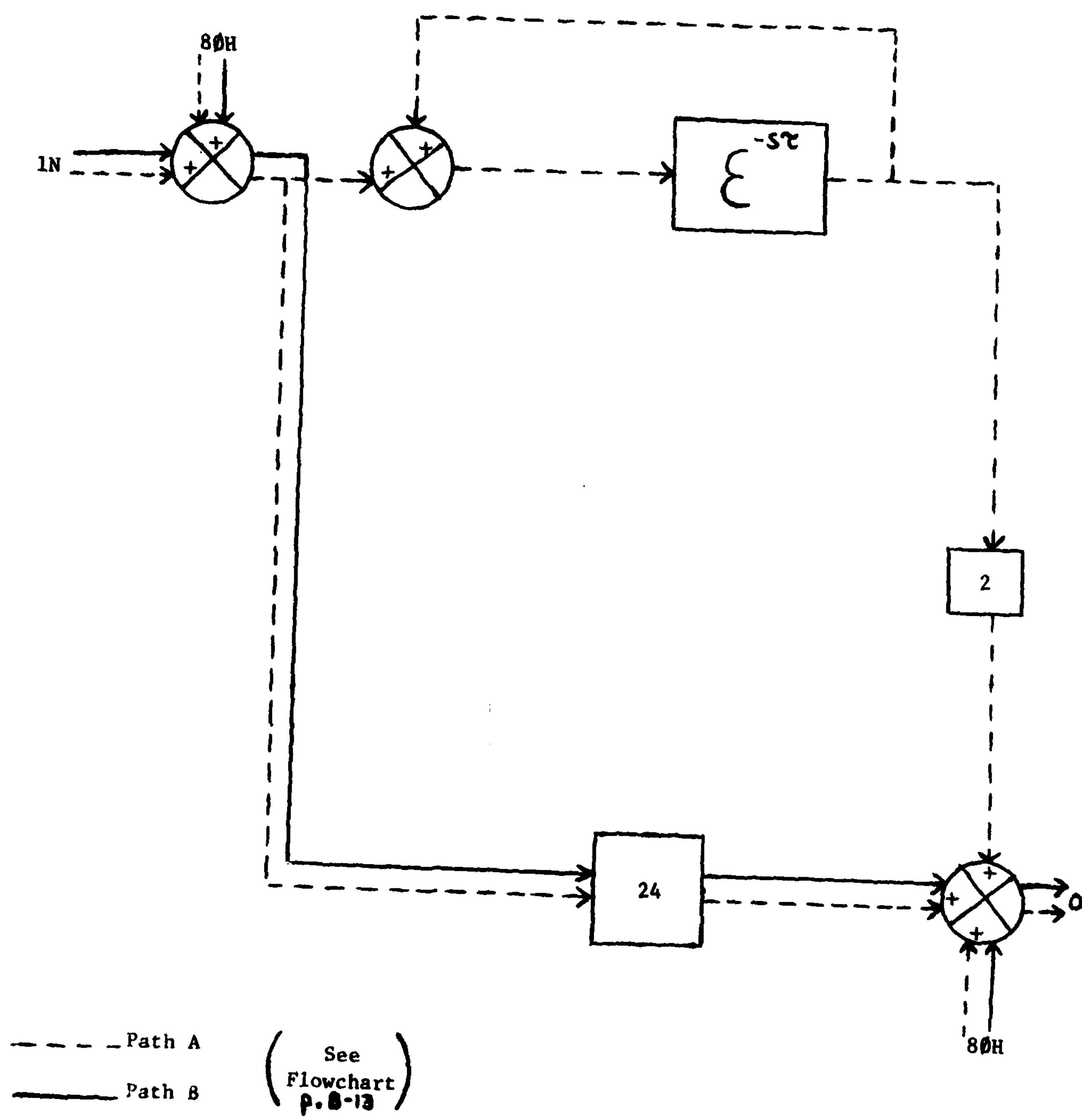
ΔV is positive for removal of load and negative for application of load

This is qualitatively the same as oscillograms taken on the real system (see Appendix D).

A simple block diagram of the entire system is illustrated below.



B-3. VOLTAGE CONTROL ALGORITHM



B-4. EQUATIONS RELATING TO DEVELOPMENT OF FREQUENCY REGULATION ALGORITHM

For Generator:

$$f = \frac{W_g P \pi}{3600}$$

Where: f = Frequency of generator voltage in Hz
W_g = Speed of engine in radians/second
p = Number of poles in generator = 24

$$f = \frac{\frac{60000}{\pi}(24)\,\pi}{3600} = 400 \qquad \left(\frac{60000}{\pi}\ \frac{\text{rad}}{\text{sec}} = 2000\ \text{RPM}\right)$$

For Diesel Engine:

$$J\frac{dW_g}{dt} + K_\beta W_g = \tau_e - \tau_g$$

Where: $\tau_g = \dfrac{P_e}{W_g} = \dfrac{\sqrt{3}\ V_g I_a \cos\theta}{W_g}$

$\tau_e = K_e X \quad (X = K_a V_c)$

J = Moment of inertia of engine and generator in watt-sec^3

W_g = Speed of engine in rad/sec

K_β = Damping coefficient in watt-secs^2

τ_e = Engine torque in watt-secs

τ_g = Generator torque in watt-secs

X = Fuel pump position in radians

K_e = Engine gain in watt-secs/radian

K_a = Woodward actuator gain

$$J\frac{dW_g}{dt} + K_\beta W_g = K_e K_a V_c - \tau_g$$

$$V_c = K_p(f_{des} - f) + K_d\frac{d(f_{des} - f)}{dt}$$

$$f_{des} - f = \frac{p\pi}{3600}(W_{g\,des} - W_g)$$

Taking Laplace transforms for no load ($\gamma g = 0$)

$$(J_S + K_f)\,\underline{Wg} = Ke\ Ka\ \frac{p\pi}{3600}\left[Kp + s Kd\right]\left(\frac{Wg\ des}{s} - \underline{Wg}\right)$$

$$\text{Where:}\quad K = \frac{Ke\ Ka\ p\pi\ Kp}{3600}$$

Note: Underscore indicates Laplace transform

$$\left[J_S + K_f + K\left(s\frac{Kd}{K_p} + 1\right)\right]\underline{Wg} = K\left(s\frac{Kd}{Kp} + 1\right)\quad\frac{Wg\ des}{s}$$

$$\underline{Wg} = \frac{K\left(1 + s\frac{Kd}{Kp}\right)}{\left(J + K\frac{Kd}{Kp}\right)s + K_f + K}\qquad\frac{Wg\ des}{s}$$

$$Wg\ \text{steady state} = \lim_{s\to 0}\ s\,\underline{Wg}$$

$$Wg\ \text{steady state} = \frac{K}{K_f + K}\quad Wg\ des$$

Therefore if $K \gg K_f$ the steady state speed will have the desired value.

$$\Delta Wg = \frac{KK_L}{(K_f + K)(K_f + K_L + K)}\quad Wg\ des$$

for $K_f = 0$

$$\Delta Wg = \frac{K_L}{K_L + K}\quad Wg\ des$$

If $\frac{\Delta Wg}{Wg\ des} = \frac{5}{400}$ & $K_L = .01$ watt-sec^2

$$\Delta Wg = \frac{.01}{.01 + K} = \frac{5}{400}$$

$$4 = .05 + 5K$$

$$K = \frac{3.95}{5} = 7.9\ \text{watt-sec}^2$$

A K of 7.9 will be enough to hold frequency within 4 Hertz.

For load on generator proportional to Wg; $\mathcal{T}g = K_L \underline{Wg}$

$$\left[Js + K_f + K\left(s\frac{Kd}{Kp} + 1\right)\right] \underline{Wg} = K\left(s\frac{Kd}{Kp} + 1\right)\frac{\underline{Wg\ des}}{s} - K_L \underline{Wg}$$

$$\left[Js + K_f + K_L + K\left(s\frac{Kd}{Kp} + 1\right)\right] \underline{Wg} = K\left(s\frac{Kd}{Kp} + 1\right)\frac{\underline{Wg\ des}}{s}$$

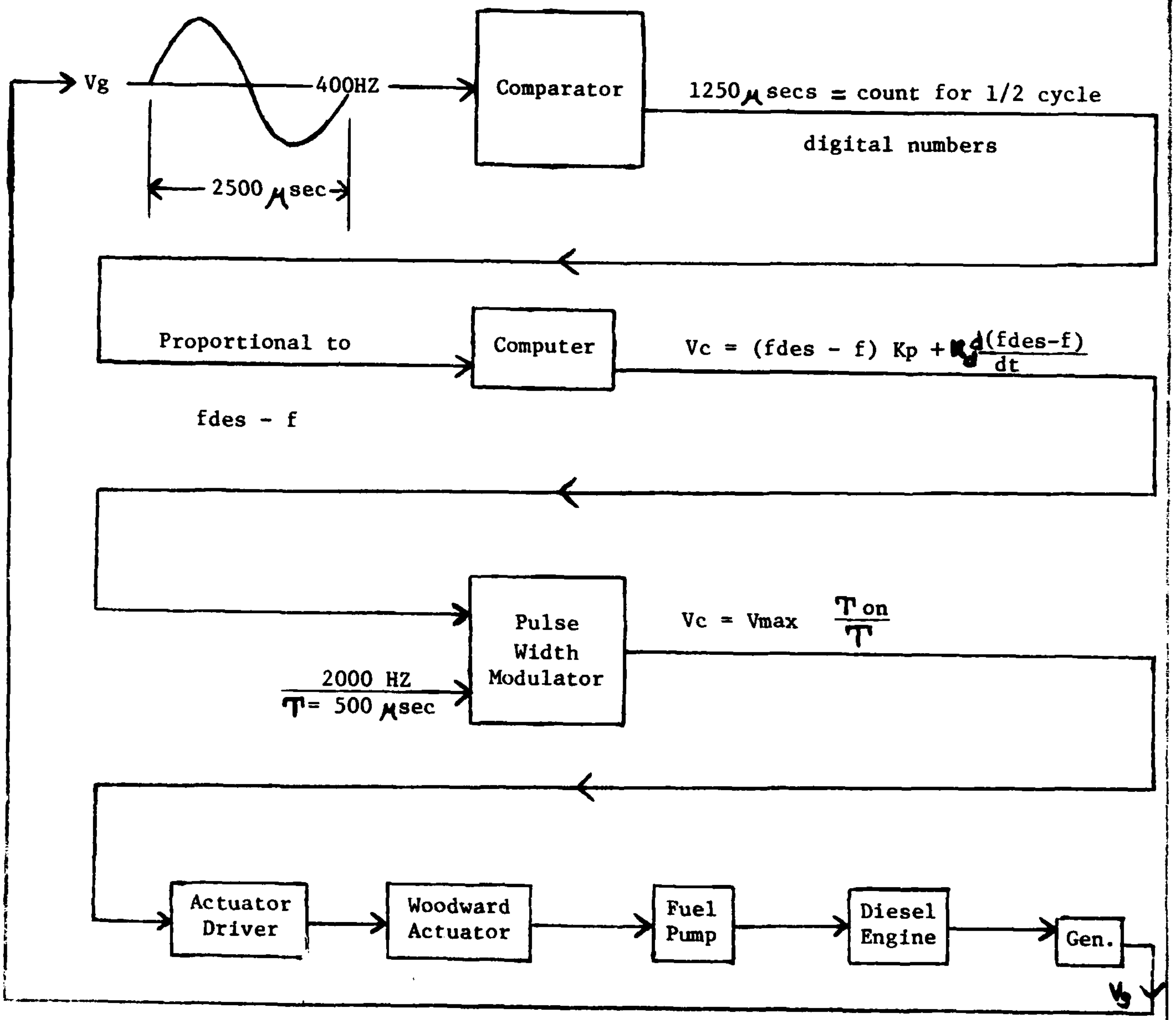
$$\underline{Wg} = \frac{K\left(s\frac{Kd}{Kp} + 1\right)}{\left(J + K\frac{Kd}{Kp}\right)s + K_f + K_L + K} \quad \frac{\underline{Wg\ des}}{s}$$

In Steady State:

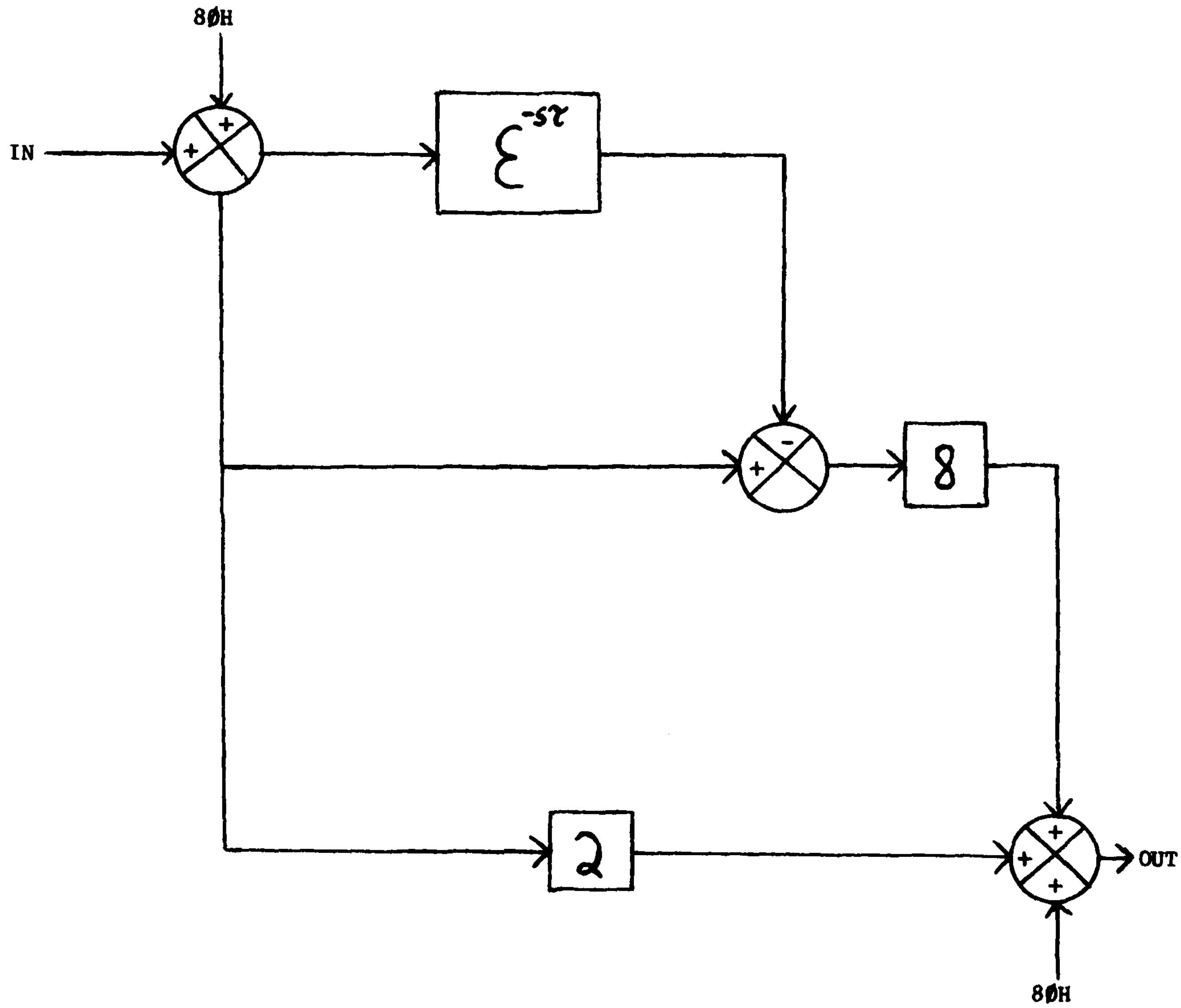
$$Wg = \frac{K}{K_f + K_L + K}\ Wg\ des \qquad \text{under load}$$

$$\Delta Wg = \left(\frac{K}{K_f + K} - \frac{K}{K_f + K_L + K}\right) Wg\ des \qquad \text{Change from no load to full load}$$

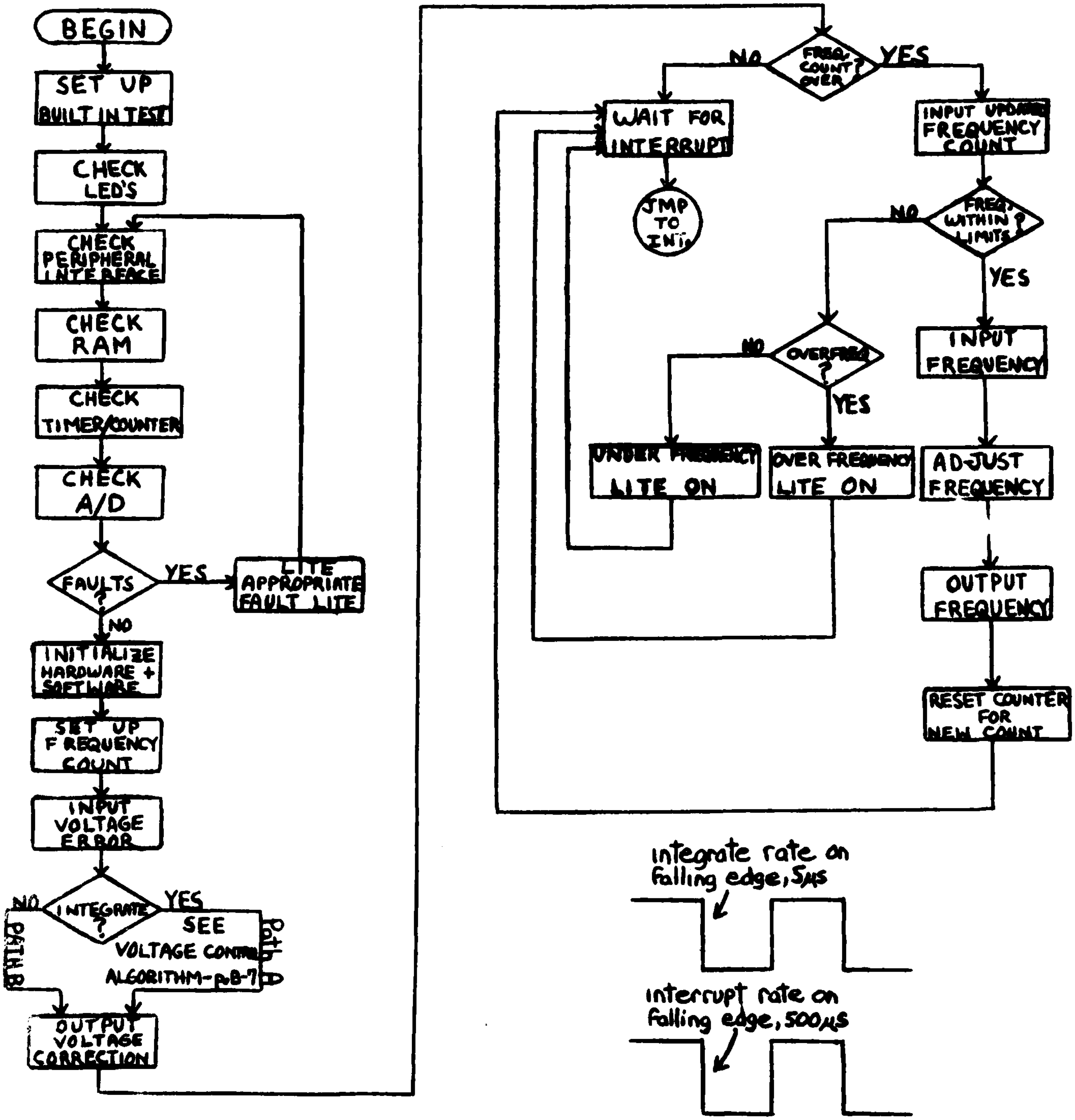
A simple block diagram of the frequency control scheme is illustrated below:



B-5. FREQUENCY CONTROL ALGORITHM



B-6. CONTROL SYSTEM FLOWCHART



B-7. CONTROL SYSTEM PROGRAM LISTING

LOCATION	OP CODE	SOURCE STATEMENT
0038		ORG 38H
0038	3EB0	MVI A,0B0H
003A	D3E6	OUT 0E6H
003C	3EF0	MVI A,0F0H
003E	D3E6	OUT 0E6H
0040	3EE0	MVI A,0E0H
0042	D3E6	OUT 0E6H
0044	3EF0	MVI A,0F0H
0046	D3E6	OUT 0E6H
0048	3EEF	MVI A,0EFH
004A	D3C0	OUT 0C0H
004C	78	MOV A,B
004D	D3C3	OUT 0C3H
004F	3E6F	MVI A,6FH
0051	D3C0	OUT 0C0H
0053	7C	MOV A,H
0054	D3C1	OUT 0C1H
0056	DBE6	IN 0E6H
0058	E602	ANI 02H
005A	DBE5	IN 0E5H
005C	EB	XCHG

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
005D	CA8D01	22		JZ	SUB1
0060	C680	23		ADI	80H
0062	4F	24		MOV	C,A
0063	7D	25		MOV	A,L
0064	F27600	26		JP	P80
0067	A7	27		ANA	A
0068	F29D00	28		JP	P81
006B	CDDA01	29		CALL	MMULT
006E	FAA000	30		JM	P83
0071	0600	31		MVI	B,0
0073	C3A900	32		JMP	TTMR
0076	A7	33	P80:	ANA	A
0077	FA8500	34		JM	P881
007A	CDE901	35		CALL	PMULT
007D	F2A000	36		JP	P83
0080	06FE	37		MVI	B,0FEH
0082	C3A900	38		JMP	TTMR
0085	CDE901	39	P881:	CALL	PMULT
0088	C680	40		ADI	80H
008A	FEFF	41		CPI	0FFH
008C	C2A800	42		JNZ	TMR
008F	3D	43		DCR	A
0090	47	44		MOV	B,A
0091	EB	45		XCHG	

LOCATION	OP CODE	LINE NUMBER	SOURCE STATEMENT		
0092	DBE6	46		IN	0E6H
0094	E604	47		ANI	4H
0096	C2B900	48		JNZ	CHECK
0099	57	49		MOV	D,A
009A	C37E01	50		JMP	INT
009D	CDDA01	51	P81:	CALL	MMULT
00A0	C680	52	P83:	ADI	80H
00A2	FEFF	53	NZI:	CPI	0FFH
00A4	C2A800	54		JNZ	TMR
00A7	3D	55		DCR	A
00A8	47	56	TMR:	MOV	B,A
00A9	EB	57	TTMR:	XCHG	
00AA	DBE6	58		IN	0E6H
00AC	E60H	59		ANI	4H
00AE	C2B900	60		JNZ	CHECK
00B1	57	61		MOV	D,A
00B2	3E40	62		MVI	A,40H
00B4	D3EA	63		OUT	0EAH
00B6	C37E01	64		JMP	INT
00B9	7A	65	CHECK:	MOV	A,D
00BA	A7	66		ANA	A
00BB	C27E01	67		JNZ	INT
00BE	14	68		INR	D
00BF	DBC2	69		IN	0C2H

LOCATION	OP CODE	LINE NUMBER	SOURCE STATEMENT		
00C1	4F	70		MOV	C,A
00C2	DBC2	71		IN	0C2H
00C4	FEFB	72		CPI	0FBH
00C6	CADD00	73		JZ	F1
00C9	D2D400	74		JNC	F2
00CC	3E45	75		MVI	A,45H
00CE	D3EA	76		OUT	0EAH
00D0	AF	77		XRA	A
00D1	C37101	78		JMP	TMR2
00D4	3E46	79	F2:	MVI	A,46H
00D6	D3EA	80		OUT	0EAH
00D8	3EFE	81		MVI	A,0FEH
00DA	C37101	82		JMP	TMR2
00DD	3E80	83	F1:	MVI	A,80H
00DF	81	84		ADD	C
00E0	4F	85		MOV	C,A
00E1	F25101	86		JP	F3
00E4	95	87		SUB	L
00E5	F20301	88		JP	F72
00E8	69	89	F91:	MOV	L,C
00E9	FEF0	90		CPI	0F0H
00EB	DA1801	91		JC	FTEST1
00EE	17	92		RAL	
00EF	3F	93		CMC	

LOCATION	OP CODE	LINE NUMBER	SOURCE STATEMENT		
00F0	17	94		RAL	
00F1	3F	95		CMC	
00F2	17	96		RAL	
00F3	67	97	F93:	MOV	H,A
00F4	79	98	F993:	MOV	A,C
00F5	FEC0	99		CPI	0C0H
00F7	DA1801	100		JC	FTEST1
00FA	17	101		RAL	
00FB	84	102		ADD	H
00FC	FA6901	103		JM	F52
00FF	AF	104		XRA	A
0100	C37101	105		JMP	TMR2
0103	69	106	F72:	MOV	L,C
0104	FE10	107		CPI	10H
0106	D23201	108		JNC	FT22
0109	07	109		RLC	
010A	17	110		RAL	
010B	17	111		RAL	
010C	67	112		MOV	H,A
010D	79	113	F772:	MOV	A,C
010E	FEC0	114		CPI	0C0H
0110	DA2101	115		JC	FTST1
0113	17	116		RAL	
0114	84	117		ADD	H

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
0115	C36901	118		JMP	F52
0118	AF	119	FTEST1:	XRA	A
0119	C37101	120		JMP	TMR2
011C	3EFE	121	FTEST2:	MVI	A,0FEH
011E	C37101	122		JMP	TMR2
0121	3E80	123	FTST1:	MVI	A,80H
0123	84	124		ADD	H
0124	C36901	125		JMP	F52
0127	3E7F	126	FTST2:	MVI	A,7FH
0129	84	127		ADD	H
012A	C36901	128		JMP	F52
012D	2680	129	FT11:	MVI	H,80H
012F	C36101	130		JMP	F33
0132	267F	131	FT22:	MVI	H,7FH
0134	C30D01	132		JMP	F772
0137	69	133	F9:	MOV	L,C
0138	FE10	134		CPI	10H
013A	D21C01	135		JNC	FTEST2
013D	07	136		RLC	
013E	17	137		RAL	
013F	17	138		RAL	
0140	67	139		MOV	H,A
0141	79	140	F99:	MOV	A,C
0142	FE40	141		CPI	40H

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
0144	D21C01	142		JNC	FTEST2
0147	07	143		RLC	
0148	84	144		ADD	H
0149	F26901	145		JP	F52
014C	3EFE	146		MVI	A,0FEH
014E	C37101	147		JMP	TMR2
0151	95	148	F3:	SUB	L
0152	F23701	149		JP	F9
0155	69	150		MOV	L,C
0156	FEF0	151		CPI	0F0H
0158	DA2D01	152		JC	FT11
015B	17	153		RAL	
015C	3F	154		CMC	
015D	17	155		RAL	
015E	3F	156		CMC	
015F	17	157		RAL	
0160	67	158		MOV	H,A
0161	79	159	F33:	MOV	A,C
0162	FE40	160		CPI	40H
0164	D22701	161		JNC	FTST2
0167	07	162		RLC	
0168	84	163		ADD	H
0169	C680	164	F52:	ADI	80H
016B	FEFF	165	D1:	CPI	0FFH

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
016D	C27101	166		JNZ	TMR2
0170	3D	167		DCR	A
0171	67	168	TMR2:	MOV	H,A
0172	3E8F	169		MVI	A,8FH
0174	D3C0	170		OUT	0C0H
0176	3EA0	171		MVI	A,0A0H
0178	D3C2	172		OUT	0C2H
017A	3EF6	173		MVI	A,0F6H
017C	D3C2	174		OUT	0C2H
		175			
017E	FB	176	INT:	EI	
017F	F1	177		POP	PSW
0180	76	178		HLT	
0181	210040	179	BEGIN:	LXI	H,4000H; START
		180			
0184	F9	181		SPHL	
0185	F5	182		PUSH	PSW
0186	3EFE	183		MVI	A,0FEH
0188	67	184		MOV	H,A
0189	57	185		MOV	D,A
018A	C37E01	186		JMP	INT
018D	C680	187	SUB1:	ADI	80H
018F	4F	188		MOV	C,A
0190	7D	189		MOV	A,L

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
0191	F2BE01	190		JP	P3
0194	A7	191		ANA	A
0195	F2A301	192		JP	P92
0198	81	193		ADD	C
0199	FAA701	194		JM	P91
019C	2E80	195		MVI	L,80H
019E	0600	196		MVI	B,0
01A0	C3A900	197		JMP	TTMR
01A3	81	198	P92:	ADD	C
01A4	F2D601	199		JP	P95
01A7	6F	200	P91:	MOV	L,A
01A8	CDDA01	201		CALL	MMULT
01AB	FAA000	202		JM	P83
01AE	0600	203		MVI	B,0
01B0	C3A900	204		JMP	TTMR
01B3	81	205	P32:	ADD	C
01B4	F2C601	206		JP	P9
		207			
01B7	2E7F	208		MVI	L,7FH
01B9	06FE	209		MVI	B,0FEH
01BB	C3A900	210		JMP	TTMR
01BE	A7	211	P3:	ANA	A
01BF	F2B301	212		JP	P32
01C2	81	213		ADD	C

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
01C3	FAD201	214		JM P995
01C6	6F	215	P9:	MOV L,A
01C7	CDE901	216		CALL PMULT
01CA	F2A000	217		JP P83
01CD	06FE	218		MVI B,0FEH
01CF	C3A900	219		JMP TTMR
01D2	6F	220	P995:	MOV L,A
01D3	C38500	221		JMP P881
01D6	6F	222	P95:	MOV L,A
01D7	C39D00	223		JMP P81
01DA	79	224	MMULT:	MOV A,C
01DB	FEFB	225		CPI 0FBH
01DD	DAFB01	226		JC TEST1
01E0	17	227		RAL
01E1	3F	228		CMC
01E2	17	229		RAL
01E3	3F	230		CMC
01E4	17	231		RAL
01E5	3F	232		CMC
01E6	C3F201	233		JMP M4
01E9	79	234	PMULT:	MOV A,C
01EA	FE06	235		CPI 6H
01EC	D2F701	236		JNC TEST2
01EF	07	237		RLC

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT	
01F0	17	238		RAL	
01F1	17	239		RAL	
01F2	4F	240	M4:	MOV	C,A
01F3	17	241		RAL	
01F4	81	242		ADD	C
01F5	85	243		ADD	L
01F6	C9	244		RET	
01F7	3E7F	245	TEST2:	MVI	A,7FH
01F9	85	246		ADD	L
01FA	C9	247		RET	
01FB	3E80	248	TEST1:	MVI	A,80H
01FD	85	249		ADD	L
01FE	C9	250		RET	
01FF	3E80	251	LED:	MVI	A,80H
0201	D3EB	252		OUT	0EBH
0203	3E40	253		MVI	A,40H
0205	210040	254	L1:	LXI	H,4000H
0208	F9	255		SPHL	
0209	D3EA	256		OUT	0EAH
020B	0E04	257		MVI	C,4H
020D	CDD902	258		CALL	DELAY
0210	DBEA	259		IN	0EAH
0212	3C	260		INR	A
0213	FE48	261		CPI	48H

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
0215	C20502	262		JNZ L1
0218	3E83	263		MVI A,83H
021A	D3E7	264		OUT 0E7H
021C	3E80	265		MVI A,80H
021E	D3EB	266		OUT 0EBH
0220	3E55	267	L2:	MVI A,55H
0222	D3E4	268	P2:	OUT 0E4H
0224	D3E8	269		OUT 0E8H
0226	D3E9	270		OUT 0E9H
0228	D3EA	271		OUT 0EAH
022A	5F	272		MOV E,A
022B	DBE4	273		IN 0E4H
022D	BB	274		CMP E
022E	C24D02	275		JNZ P8
0231	DBE8	276		IN 0E8H
0233	BB	277		CMP E
0234	C24D02	278		JNZ P8
0237	DBE9	279		IN 0E9H
0239	BB	280		CMP E
023A	C24D02	281		JNZ P8
023D	DBEA	282		IN 0EAH
023F	BB	283		CMP E
0240	C24D02	284		JNZ P8
0243	FEAA	285		CPI 0AAH

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
0245	CA6502	286		JZ P1
0248	3EAA	287		MVI A,0AAH
024A	C32202	288		JMP P2
024D	3E41	289	P8:	MVI A,41H
024F	D3EA	290		OUT 0EAH
0251	0E03	291		MVI C,3H
0253	CDD902	292		CALL DELAY
0256	C36502	293		JMP P1
0259	3E43	294	T8:	MVI A,43H
025B	D3EA	295		OUT 0EAH
025D	0E03	296		MVI C,3H
025F	CDD902	297		CALL DELAY
0262	C37902	298		JMP P4
0265	3EEF	299	P1:	MVI A,0EFH
0267	D3C0	300		OUT 0C0H
0269	D3C3	301		OUT 0C3H
026B	DBC3	302		IN 0C3H
026D	FEEF	303		CPI 0EFH
026F	3E6F	304		MVI A,6FH
0271	D3C0	305		OUT 0C0H
0273	D3C1	306		OUT 0C1H
0275	DBC1	307		IN 0C1H
0277	FE6F	308		CPI 6FH
0279	21FF3B	309	P4:	LXI H,3BFFH

LOCATION	OP CODE	LINE NUMBER	SOURCE STATEMENT
027C	23	310 R1:	INX H
027D	4E	311	MOV C,M
027E	79	312	MOV A,C
027F	2F	313	CMA
0280	77	314	MOV M,A
0281	7E	315	MOV A,M
0282	2F	316	CMA
0283	91	317	SUB C
0284	C2B602	318	JNZ R8
0287	71	319	MOV M,C
0288	7C	320	MOV A,H
0289	DE3F	321	SBI 3FH
028B	C27C02	322	JNZ R1
028E	7D	323	MOV A,L
028F	DEFF	324	SBI 0FFH
0291	C27C02	325	JNZ R1
0294	3EF0	326	MVI A,0F0H
0296	D3E6	327	OUT 0E6H
0298	3EE0	328	MVI A,0E0H
029A	D3E6	329	OUT 0E6H
		330	
029C	3EF0	331	MVI A,0F0H
029E	D3E6	332	OUT 0E6H
02A0	DBE6	333	IN 0E6H

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
02A2	E601	334		ANI 1H
02A4	C2C202	335		JNZ AD8
02A7	0E01	336		MVI C,1H
02A9	CDD902	337		CALL DELAY
02AC	DBE6	338		IN 0E6H
02AE	E601	339		ANI 1H
02B0	CAC202	340		JZ AD8
02B3	C3CB02	341		JMP READY
02B6	3E42	342	R8:	MVI A,42H
02B8	D3EA	343		OUT 0EAH
02BA	0E03	344		MVI C,3H
02BC	CDD902	345		CALL DELAY
02BF	C3CB02	346		JMP READY
02C2	3E44	347	AD8:	MVI A,44H
02C4	D3EA	348		OUT 0EAH
02C6	0E03	349		MVI C,3H
02C8	CDD902	350		CALL DELAY
02CB	DBEA	351	READY:	IN 0EAH
02CD	E655	352		ANI 55H
02CF	C22002	353		JNZ L2
02D2	3E40	354		MVI A,40H
02D4	D3EA	355		OUT 0EAH
02D6	C38101	356		JMP BEGIN
02D9	21003F	357	DELAY:	LXI H,3F00H

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
02DC	71	358		MOV M,C
02DD	2C	359		INR L
02DE	3601	360		MVI M,1H
02E0	21003F	361	D5:	LXI H,3F00H
02E3	7E	362		MOV A,M
02E4	2C	363		INR L
02E5	96	364		SUB M
02E6	DA0B03	365		JC D8
02E9	2C	366		INR L
02EA	3601	367		MVI M,1H
02EC	3E04	368	D4:	MVI A,4H
02EE	21023F	369		LXI H,3F02H
		370		
02F1	96	371		SUB M
02F2	DA0603	372		JC D6
02F5	3EFA	373		MVI A,0FAH
02F7	060C	374		MVI B,0CH
		375		
02F9	48	376	D3:	MOV C,B
02FA	0D	377	D2:	DCR C
02FB	C2FA02	378		JNZ D2
02FE	3D	379		DCR A
02FF	C2F902	380		JNZ D3
0302	34	381		INR M

LOCATION	OP CODE	LINE NUMBER		SOURCE STATEMENT
0303	C2EC02	382		JNZ D4
0306	2D	383	D6:	DCR L
		384		
0307	34	385		INR M
0308	C2E002	386		JNZ D5
030B	C9	387	D8:	RET
		388		
0038		389		END 38H

APPENDIX C

MICROCOMPUTER CONTROL SYSTEM HARDWARE

C-1. MICROCOMPUTER CONTROL BOARD

COMPONENT LIST

A1 - header

A2 - header

A3 - 741CJ

A4 - 7402

A5 - AH0126

A6 - header

A7 - 7400

A8 - 7400

A9 - MM5357

B1 - 1K resistor network chip

B2 - empty

B3 - empty

B4 - 7476

B5 - 7476

B6 - header

B7 - 54S04

B8 - 74S00

B9 - 8253

C1 - header

C2 - header

C3 - empty

C4 - MC1711

C5 - header

C6 - 54192

C7 - 54192

C8 - 54192

D1 - header

D2 - 3205

D3 - 74LS192

D4 - 74123

PIN ASSIGNMENTS

T1 - edge connector on microcomputer control board

J1, P1, P2 - connectors on Intel SBC 80/10 board

T1-1	+5V	T1-2	GND	T1-41	J-31	T1-42	P1-68
3	+12V	4	-	43	-	44	P1-67
5	-12V	6	-	45	-	46	P1-70
7	-5V	8	-	47	-	48	P1-69
9	-	10	frequency comparator circuit input	49	-	50	P1-72
11	J1-1	12	GND	51	-	52	P1-71
13	J1-3	14	A10-1 on 80/10 board	53	-	54	P1-74
15	J1-5	16	A10-4 " " "	55	-	56	P1-73
17	J1-7	18	A10-13 " " "	57	-	58	P1-22
19	J1-9	20	A9-4 " " "	59	J1-49	60	P1-21
21	J1-11	22	Ready/Run Led	61	-	62	P1-58
23	J1-13	24	I/O LED	63	-	64	P1-57
25	J1-15	26	RAM LED	65	-	66	P1-23
27	-	28	TIMER LED	67	-	68	-
29	A4-12 on 80/10 Board	30	A/D LED	69	-	70	Voltage Input
31	J1-21	32	Overspeed LED	71	-	72	-
33	J1-23	34	Underfrequency LED	73	-	74	Woodward Driver Circuit Input
35	J1-25	36	Program not running LED	75	-	76	-
37	-	38	P2-28	77	-	78	Field Driver Circuit Input
39	J1-29	40	A14-15 on 80/10 board	79	+5V	80	GND

PARTS LIST

R1	5KΩ pot, 1/4 Watt	R23	120 Ω	C2	.01µf
R2	2.5 KΩ	R24	120 Ω	C3	180nf
R3	15.2 KΩ	R25	120 Ω	C4	.33µf, 1000V
R4	183 Ω	R26	120 Ω	C5	.0028µf
R5	2.0 KΩ	R27	120 Ω	D1	1N4001
R6	10 KΩ pot, 1/4 Watt	R28	120 Ω	D2	1N754
R7	10 KΩ	R29	160.75 KΩ	D3	1N4001
R8	1 KΩ	R30	1.5 KΩ pot, 1/4 Watt	D4	1N4001
R9	1 KΩ	R31	1 KΩ	D5	1N750
R10	1 KΩ	R32	1 KΩ	D6	1N750
R11	1 KΩ	R33	1 KΩ	D7	1N4001
R12	1 KΩ	R34	50Ω pot, 10 Watt	D8	1N4005
R13	1 KΩ	R35	47 KΩ	D9	1N4005
R14	1 KΩ	R36	1 KΩ	D10	1N4005
R15	220 KΩ	R37	1 KΩ	D11	1N4001
R16	47 KΩ	R38	10 KΩ	D12	1N4001
R17	2.2 KΩ	R39	10 KΩ	D13	1N249B
R18	2.2 KΩ	R40	3.3 KΩ	Q1	2N2222
R19	1 KΩ pot, 1/4 Watt	R41	688Ω, 2 Watt	Q2	2N2222
R20	1 KΩ	R42	1 KΩ	Q3	2N2222
R21	120Ω	R43	1.5Ω, 150 Watt	Q4	2N3055
R22	120Ω	C1	.1µf	Q5	2N2222
				Q6	2N3741
				Q7	2N6282

Various bypass capacitors of .1µf were used between +5V and GND.

WIRE LIST

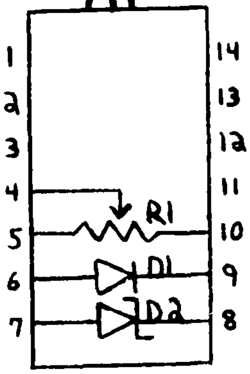
FROM	TO	FROM	TO	FROM	TO
A1-4	A1-5	A4-10	B5-16	A7-8	T1-13
5	A1-9	11	A4-12,A5-13	9	A7-10
6	A1-7	13	A5-9	A7-11	T1-11
8	GND	14	+5V	12	A7-13
9	A2-4	A5-1	A5-7,A6-12	14	+5V
A2-2	A3-4,A2-5	10	GND	A8-1	A8-2
5	A2-3	11	+12V	3	T1-19
10	A3-10	12	-12V	4	A8-5
11	-12V	A6-1	B6-7	6	T1-21
12	A1-10	2	GND	7	GND
13	T1-70	3	T1-33	8	T1-23
A3-4	A2-5	4	+12V	9	A8-10
5	GND	6	B6-14,A6-10	11	T1-25
6	-12V	8	GND	12	A8-13
10	A5-8	12	A6-7	14	+5V
11	+12V	13	-12V	A9-1	A8-1
A4-1	A9-6	14	A9-12	2	A8-4
4	A4-11	A7-1	A7-2	3	A8-9
5	T1-41,A4-6	3	T1-17	4	A8-12
7	GND	4	A7-5	5	A6-9
8	A4-9,B5-4	6	T1-15	8	-12V
9	T1-31	7	GND	9	T1-35

FROM	TO	FROM	TO	FROM	TO
A9-10	+5V	B5-13	GND	B9-2	T1-44
13	A7-1	14	B5-12,A4-3	3	T1-46
14	A7-4	15	B5-9	4	T1-48
15	+5V	B6-1	B6-13	5	T1-50
16	A7-9	2	B6-3	6	T1-52
17	A7-12	6	-12V	7	T1-54
18	GND	8	GND	8	T1-56
B1-5	B7-2	11	+5V	10	C1-14
10	+5V	12	B6-4	11	B7-4
11	+5V	14	B6-9	12	GND
12	+5V	B7-1	GND	14	B7-11
13	T1-78	3	GND	15	A9-11
14	GND	4	B1-1	16	B7-8
15	+5V	6	B8-5,B1-2	17	T1-74
16	+5V	7	GND	18	B9-9
B4-1	T1-38	8	B1-6	19	T1-64
4	B4-16,C2-5	9	GND	20	T1-62
5	+5V	10	B1-7,T1-29	21	T1-40,B7-5
11	B9-9	11	C5-13	22	T1-60,B8-1
12	B4-9	14	+5V	23	T1-58,B8-2
13	GND	B8-3	B8-4	24	+5V
15	B4-6,A9-11	6	T1-66	C1-1	B1-3,B1-4
B5-1	B5-6,B4-15	7	GND	2	+5V
5	+5V	14	+5V	3	C1-4
11	A4-2	B9-1	T1-42	C2-7	+5V

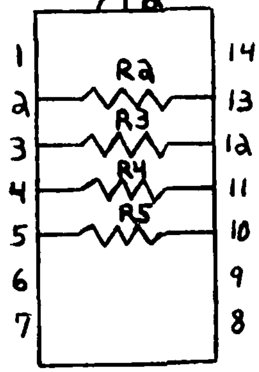
FROM	TO	FROM	TO	FROM	TO
C2-8	B4-9	C7-8	GND	D2-1	T1-14
10	+5V	12	C8-5	2	T1-16
C4-2	GND	14	GND	3	T1-18
4	T1-7	16	+5V	4	GND
5	T1-10	C8-5	C7-12	5	GND
6	T1-12	8	GND	6	T1-20
9	B7-2	12	T1-59	8	GND
10	C5-1	14	GND	16	+5V
11	+12V	16	+5V	D3-5	C8-12
12	GND	D1-1	D2-15	8	GND
C5-3	C5-5	2	D2-14	12	D4-1
4	GND	3	D2-13	14	GND
6	T1-7	4	D2-12	16	+5V
7	GND	5	D2-11	D4-4	T1-39
8	C5-9,B9-14	6	D2-10	8	GND
9	C5-10	7	D2-9	14	C1-12
10	C5-13	8	D2-7	15	C1-4
11	+5V	9	T1-36	16	+5V,C1-11
14	+5V	10	T1-34		
C6-5	T1-38	11	T1-32		
8	GND	12	T1-30		
12	C7-5	13	T1-28		
14	GND	14	T1-26		
16	+5V	15	T1-24		
C7-5	C6-12	16	T1-22		

HEADER ASSEMBLIES

A1



A2



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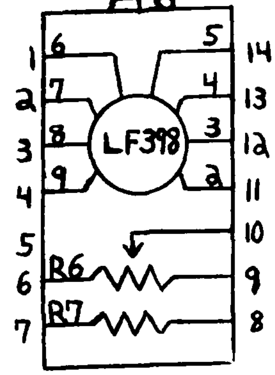
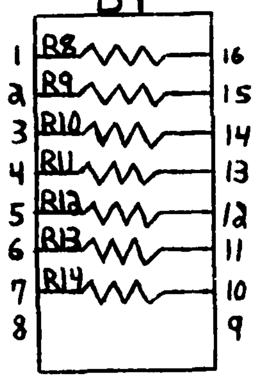
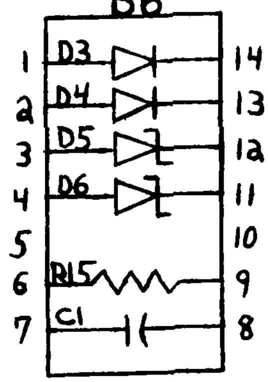


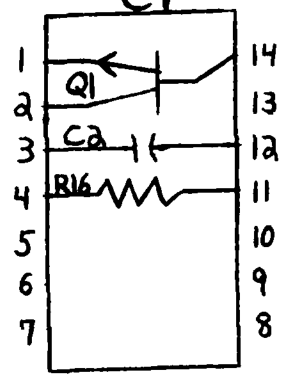
B1



B6



C1



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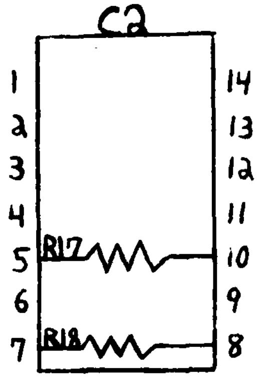

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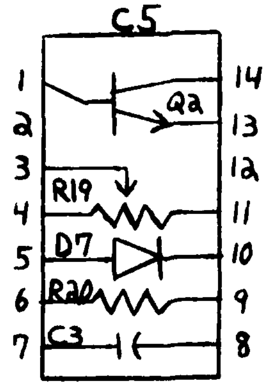
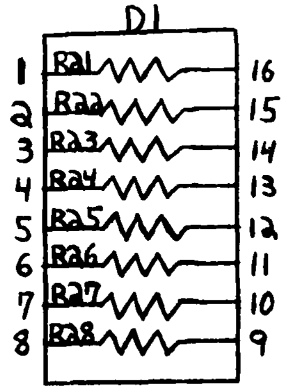
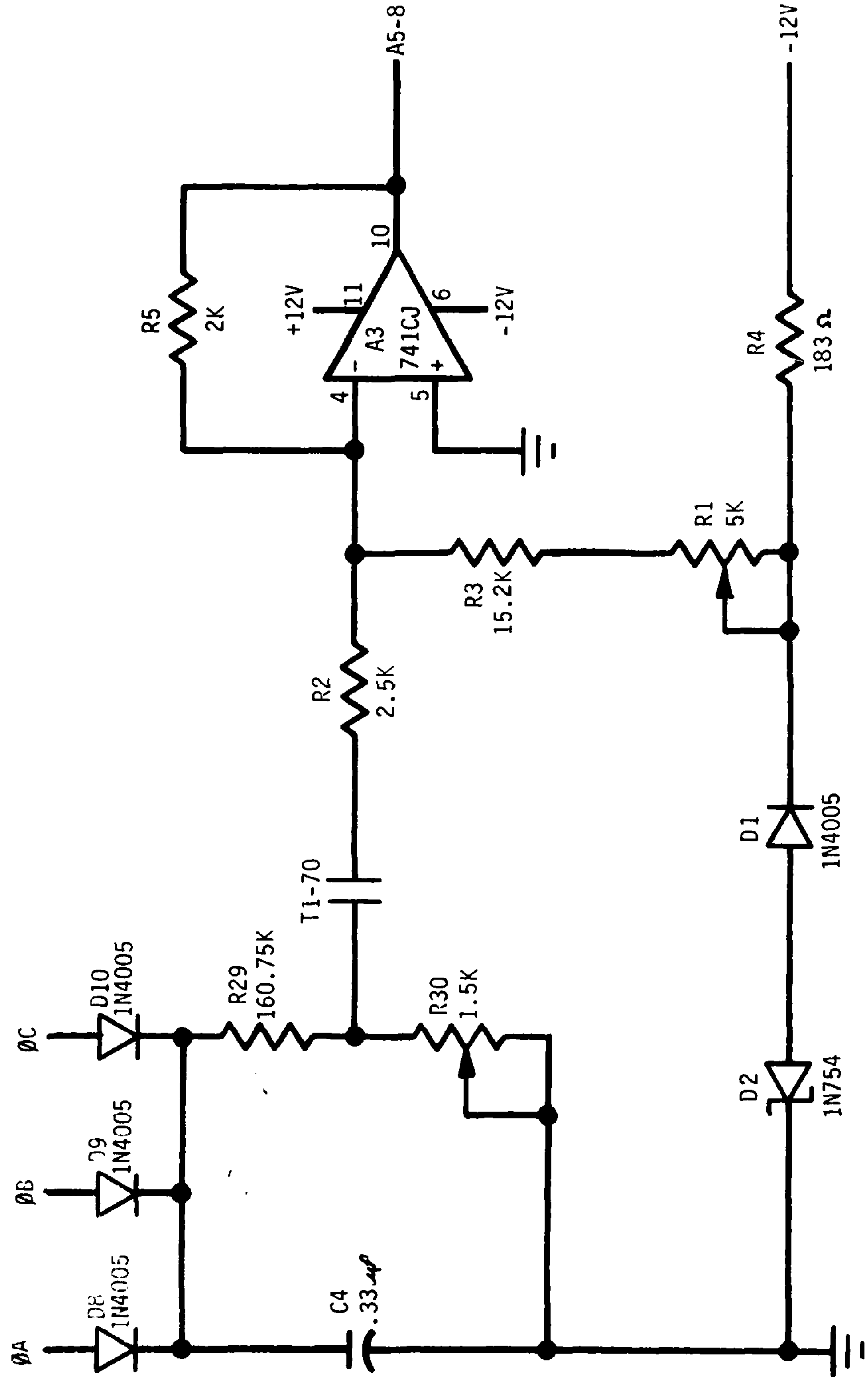
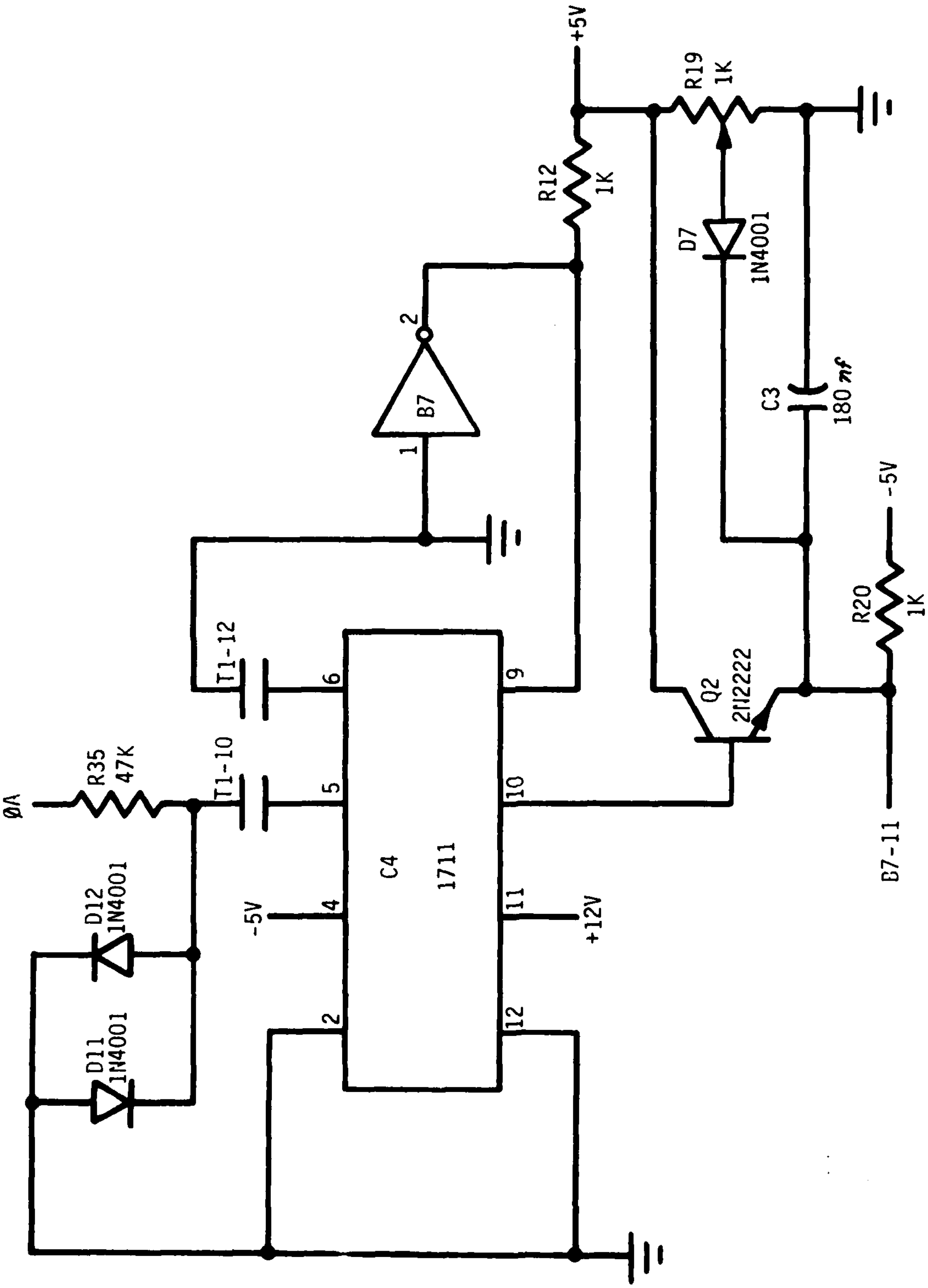


D1

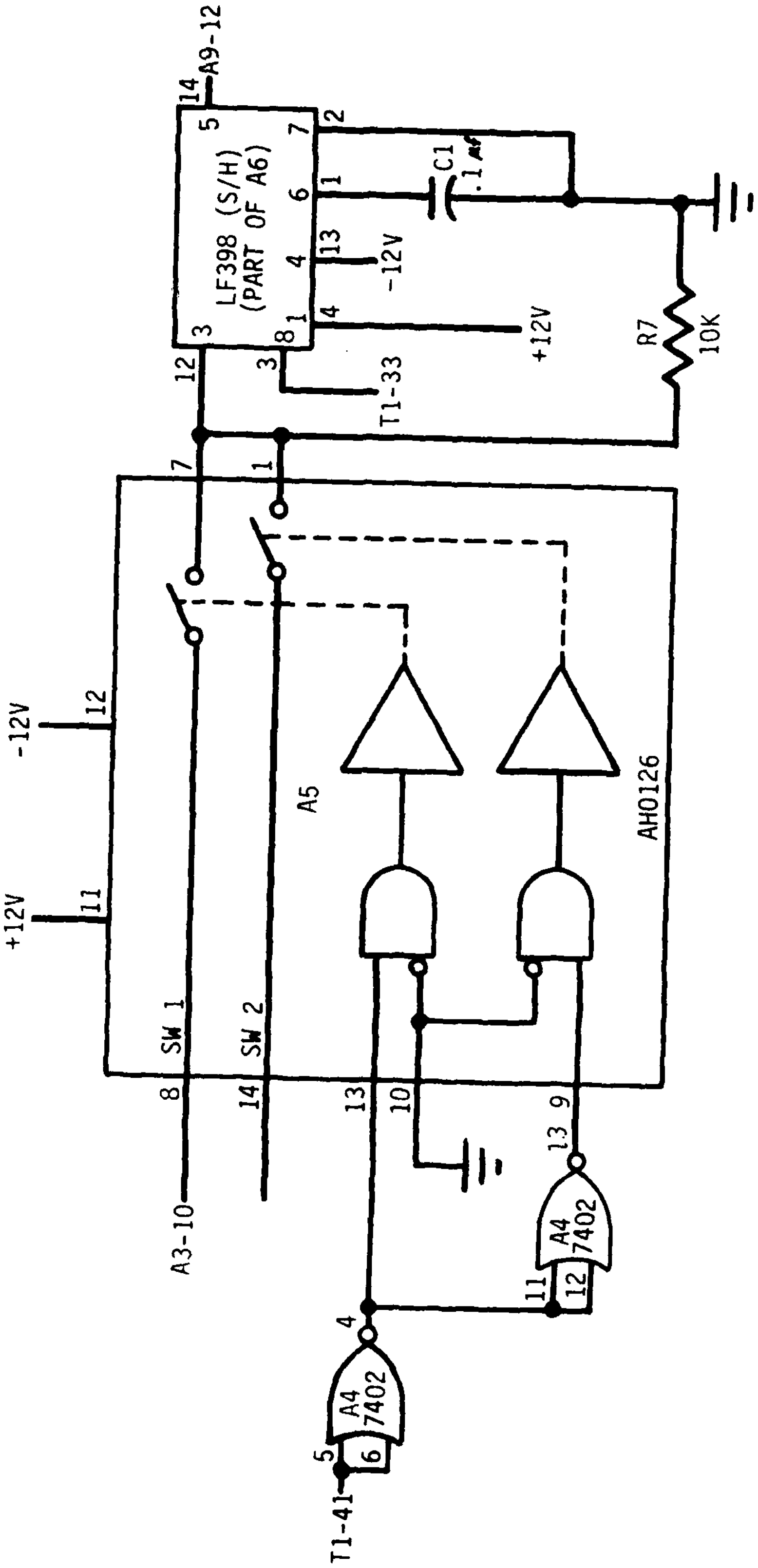




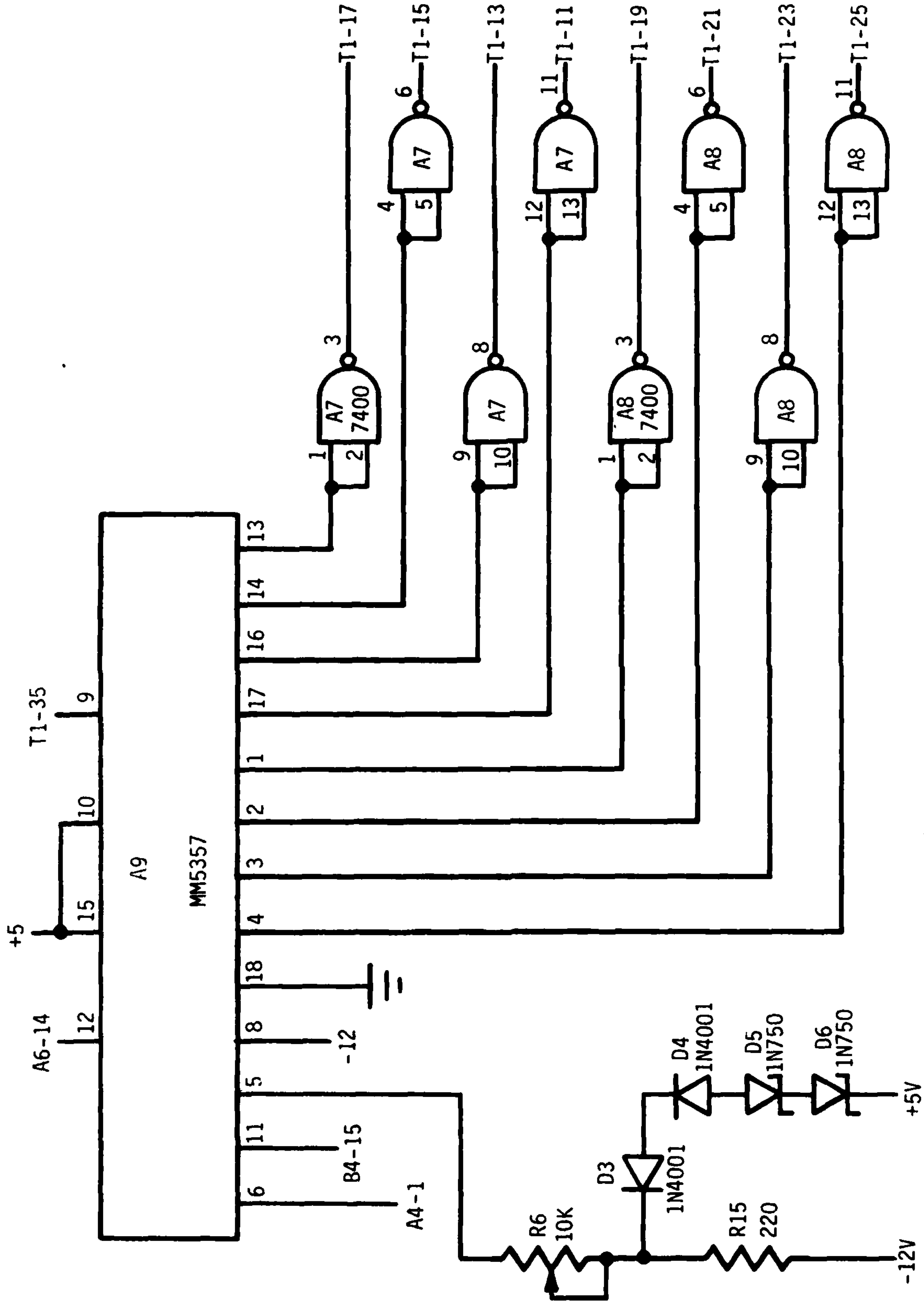
THREE PHASE VOLTAGE TO ANALOG SWITCH CIRCUIT



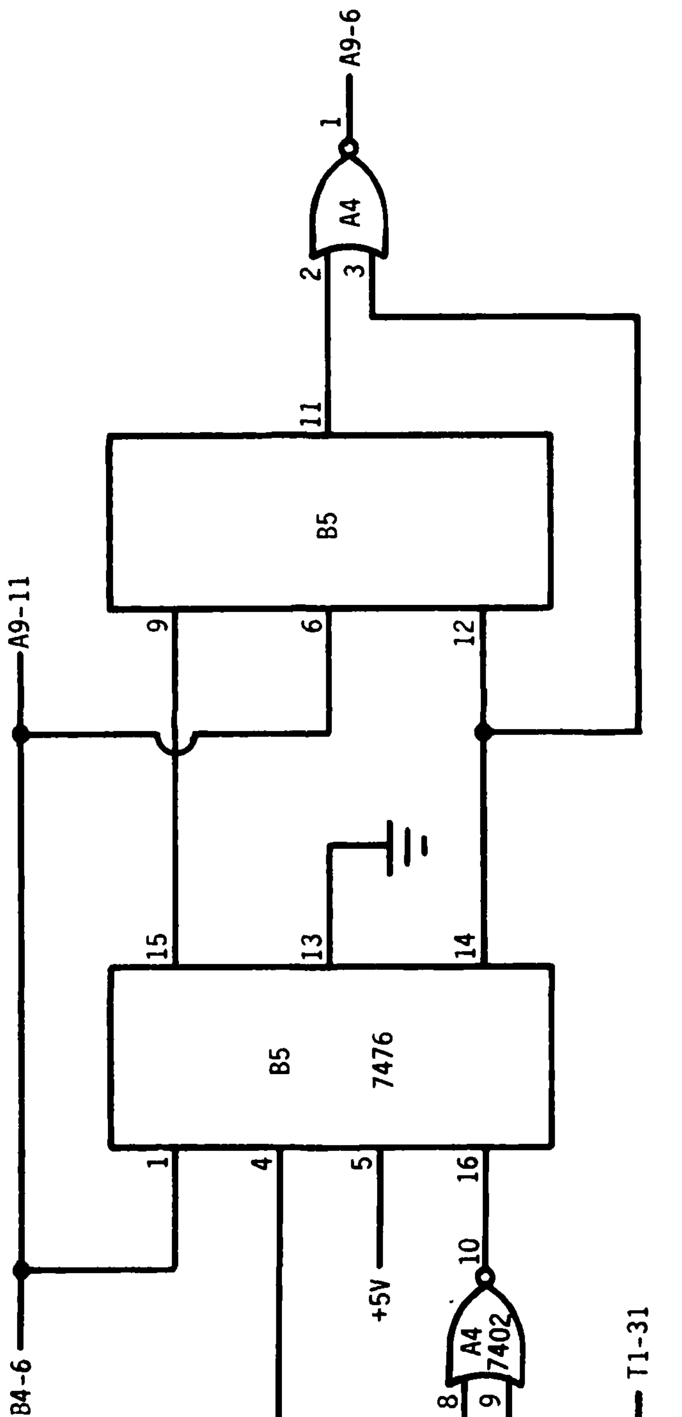
FREQUENCY COMPARATOR CIRCUIT



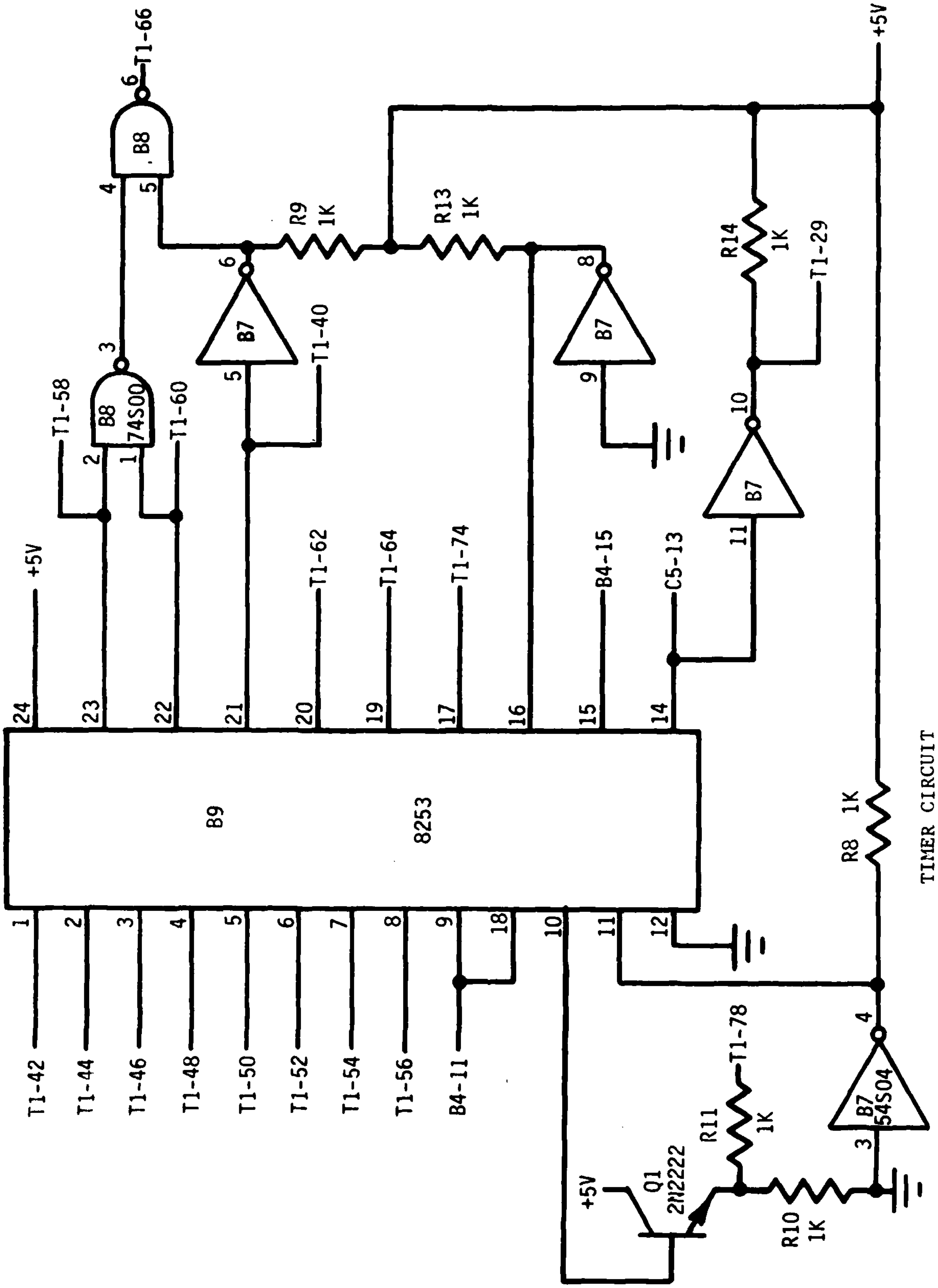
ANALOG SWITCH-SAMPLE AND HOLD CIRCUIT


T1-17
T1-15
T1-13
T1-11
T1-19
T1-21
T1-23
T1-25
A7
7400
A8
7400
A7
A8
A9
MM5357
T1-35
+5
A6-14
-12
B4-15
A4-1
R6
10K
D3
1N4001
D4
1N4001
D5
1N750
D6
1N750
R15
220
+5V
-12V

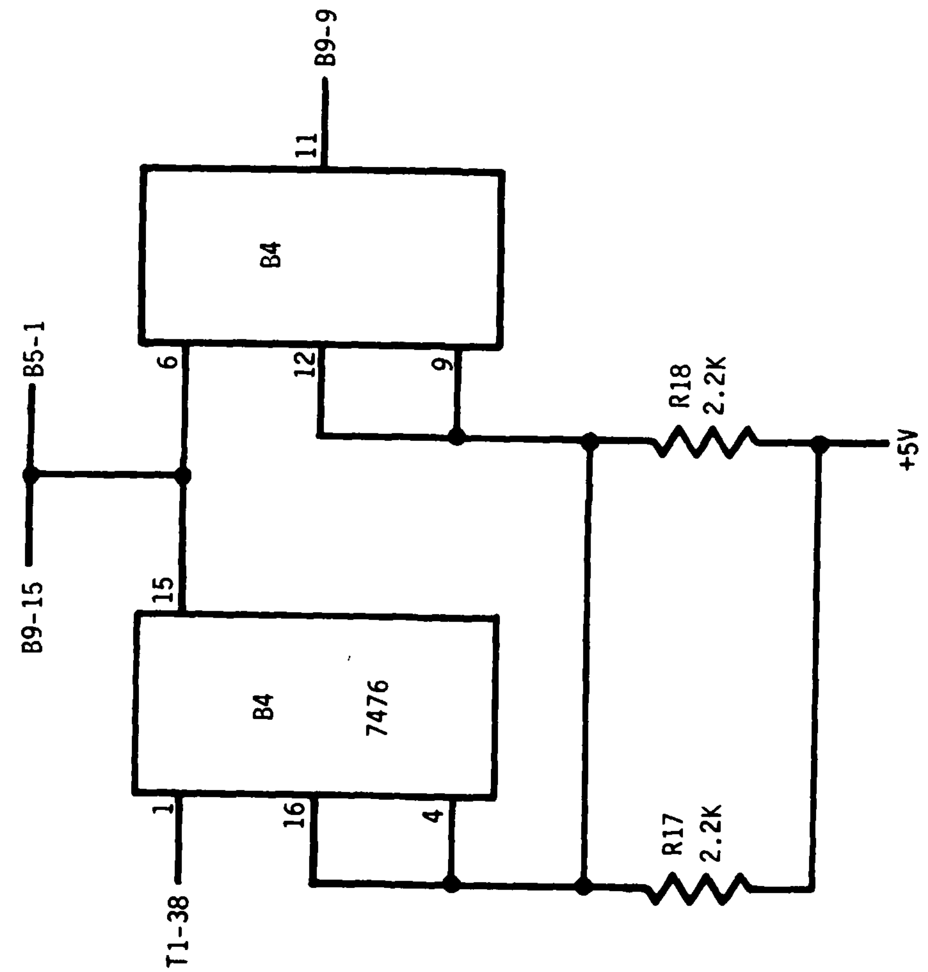
A/D CIRCUIT



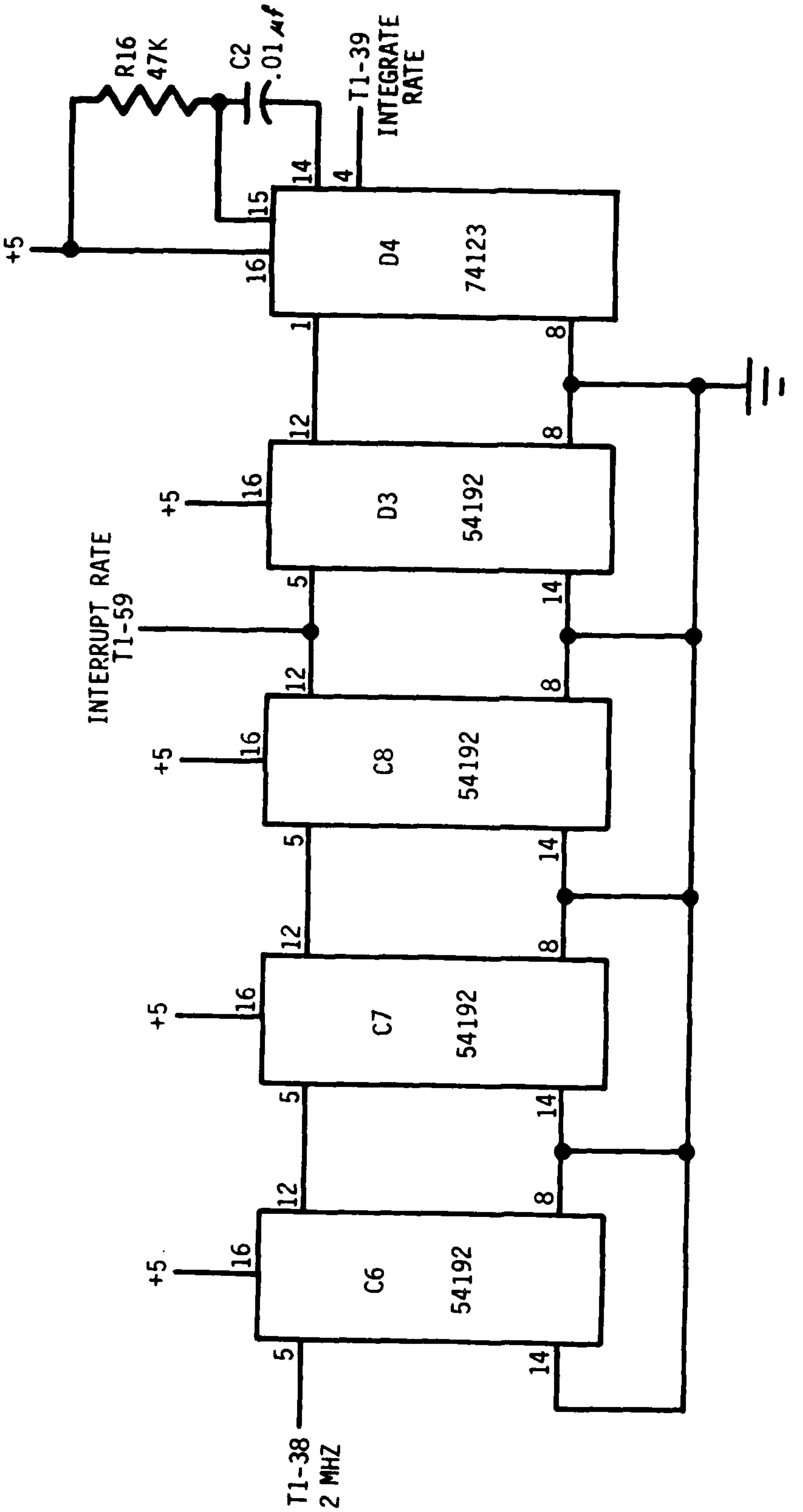
CONVERT SIGNAL CIRCUIT FOR A/D



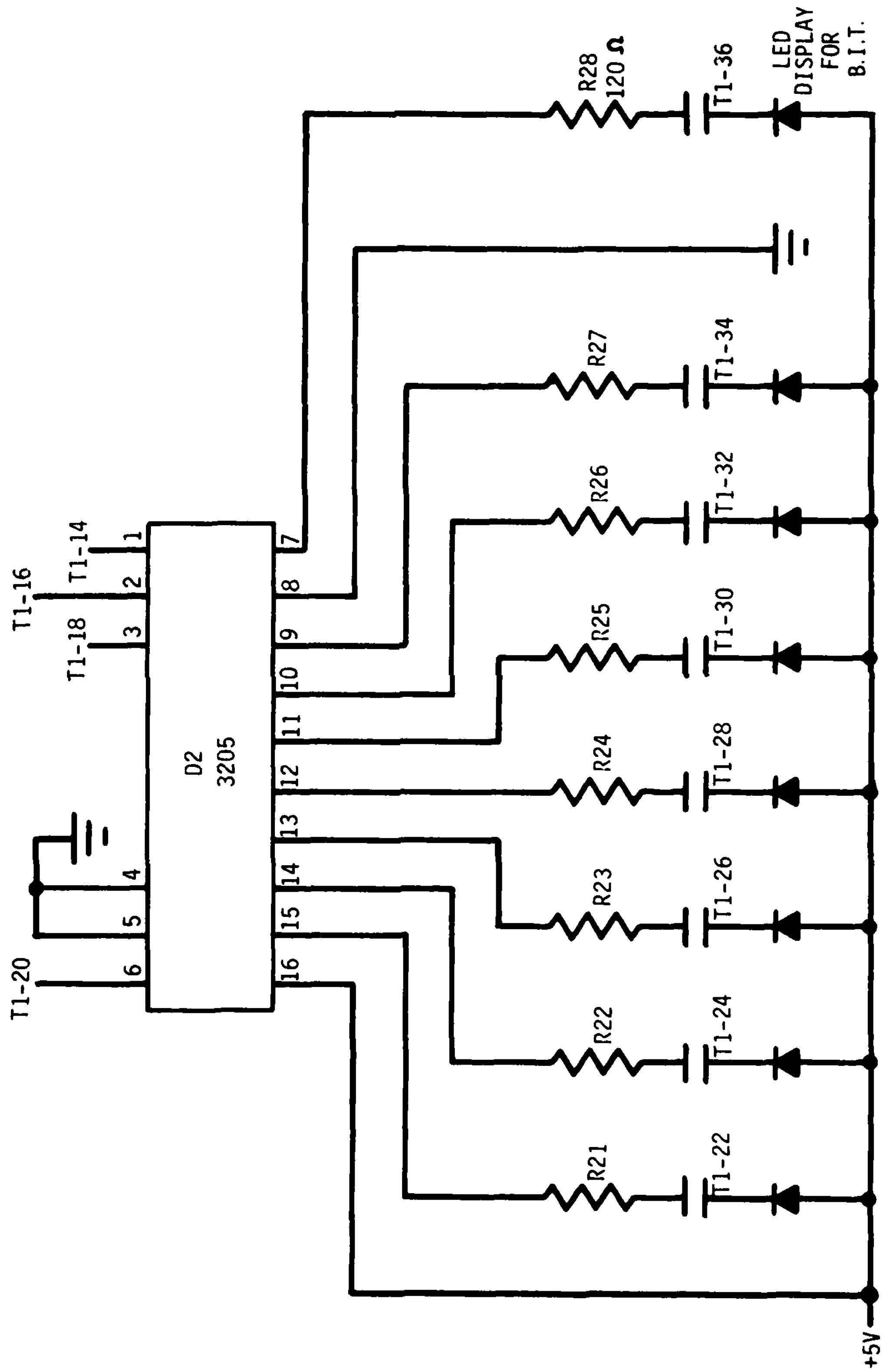
TIMER CIRCUIT



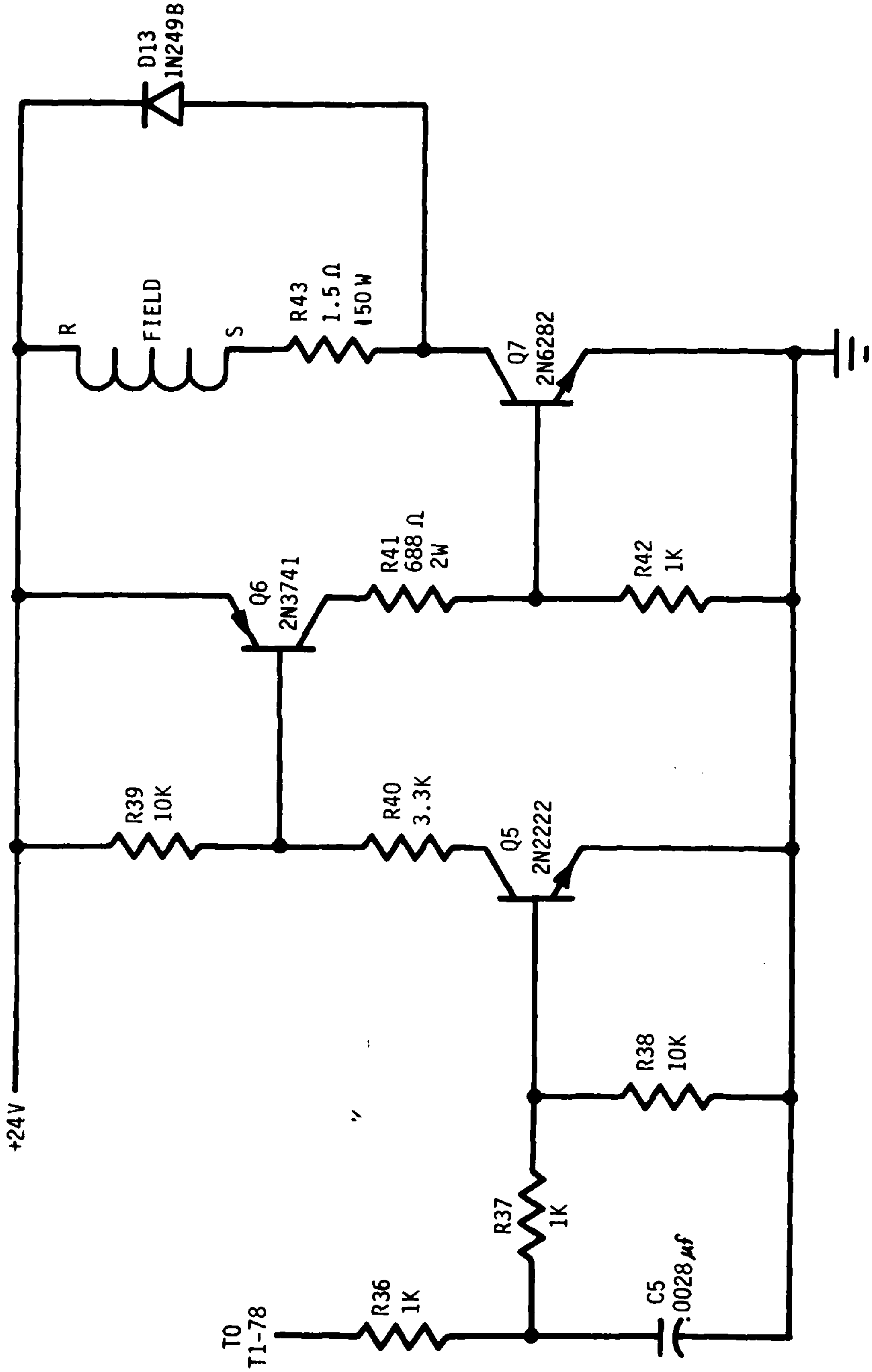
CLOCK SOURCE CIRCUIT



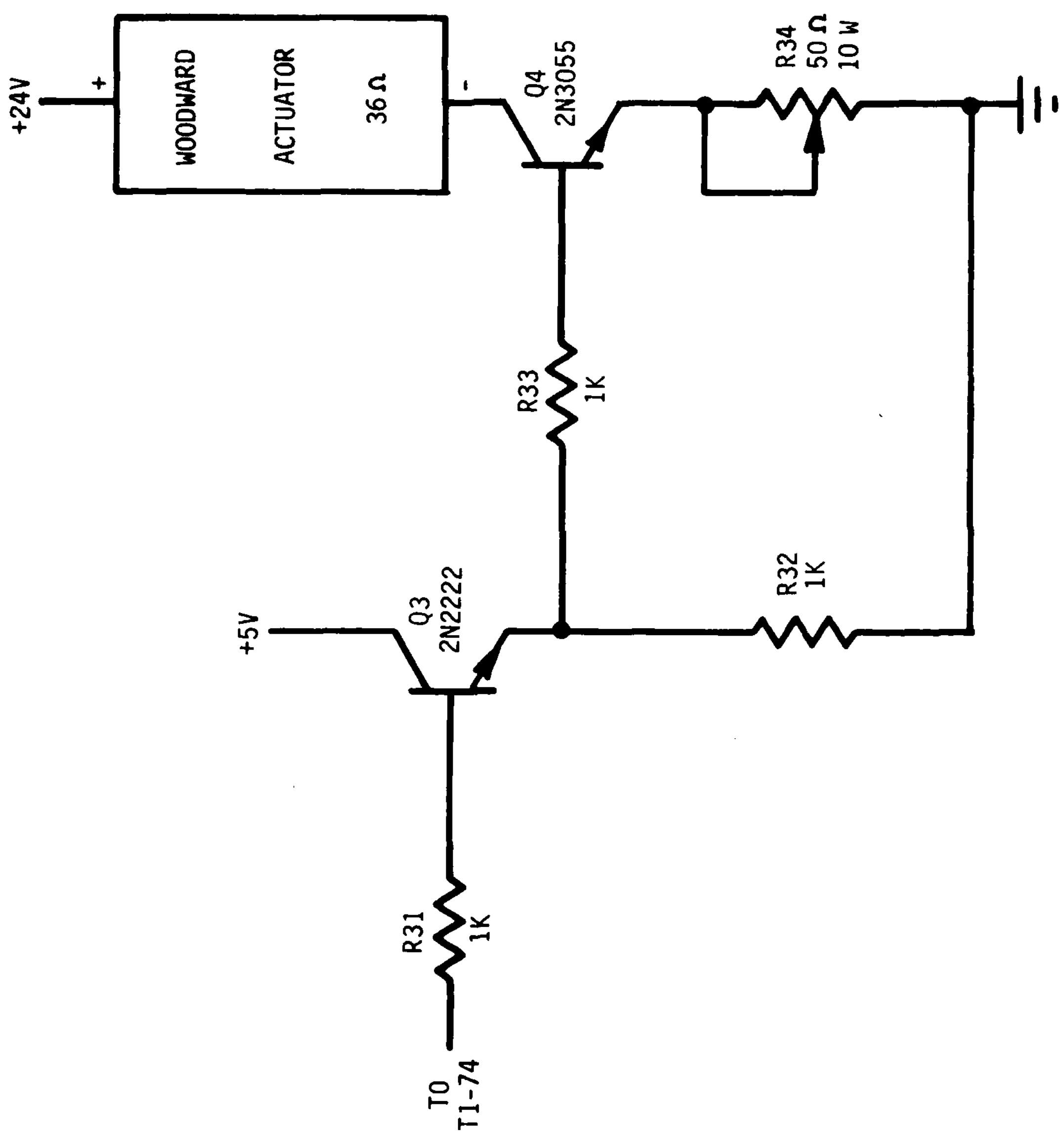
CLOCK FREQUENCY DIVIDER CIRCUIT



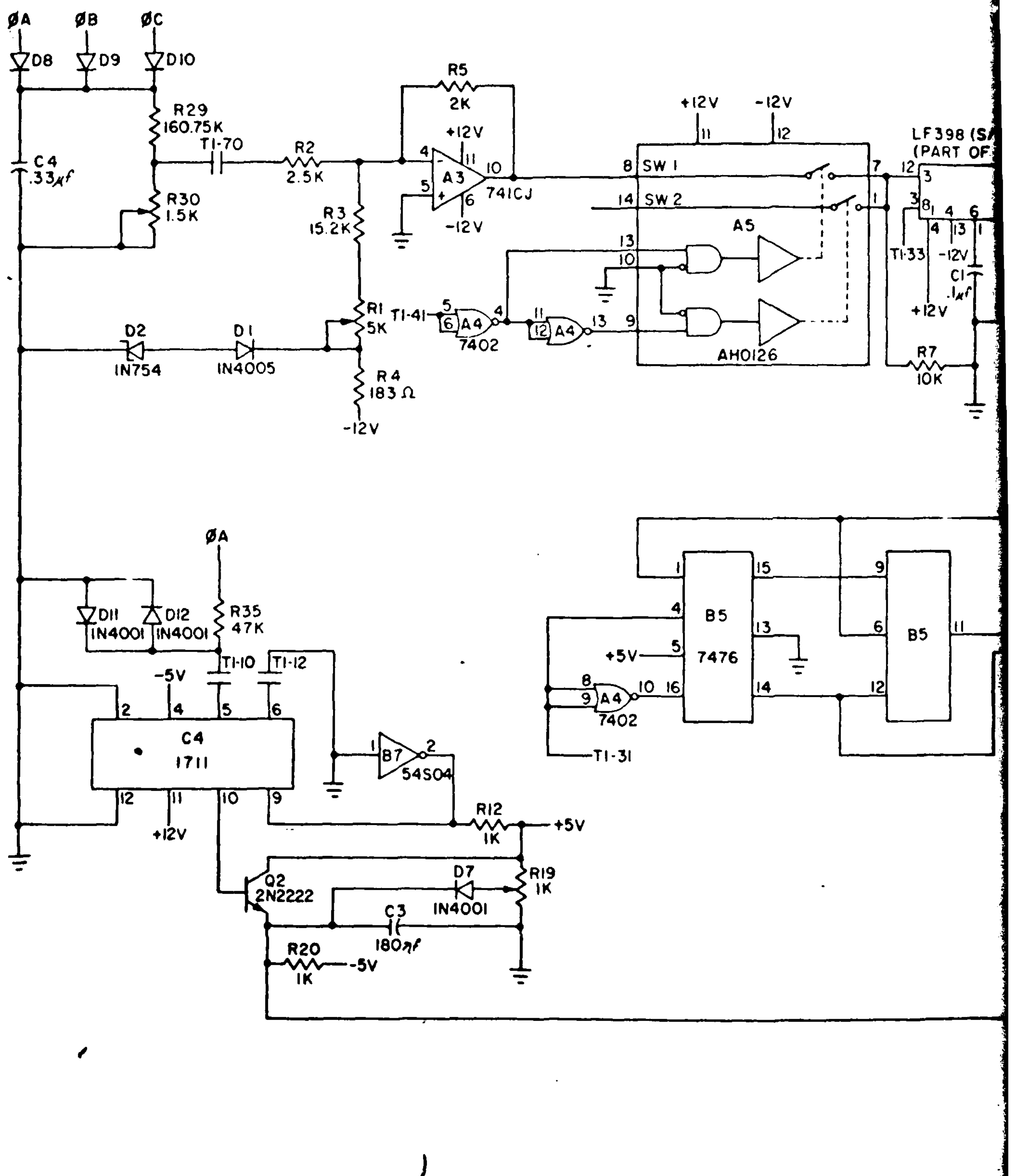
1 OF 8 DECODER CIRCUIT FOR L E D DISPLAY



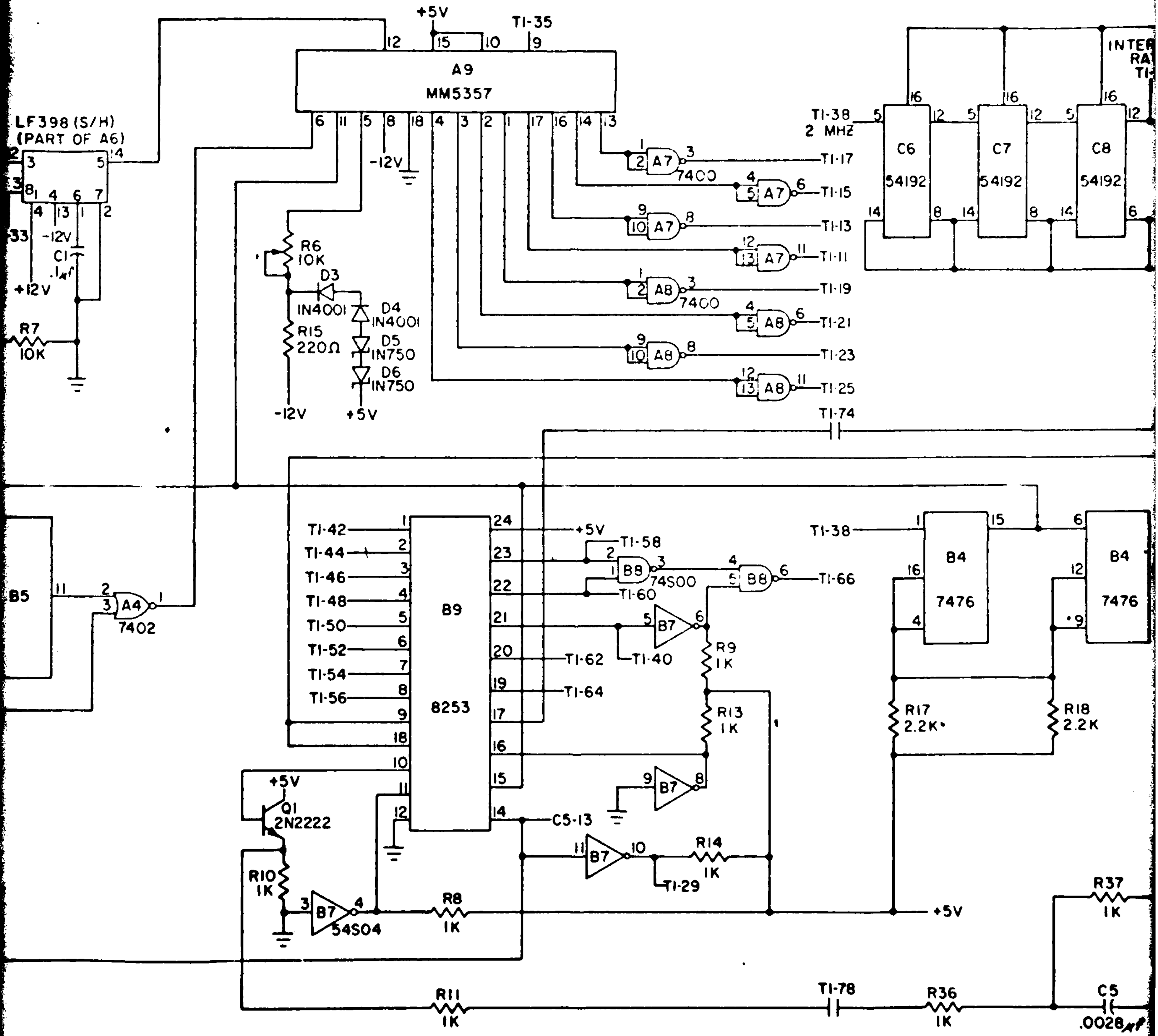
FIELD DRIVER CIRCUIT



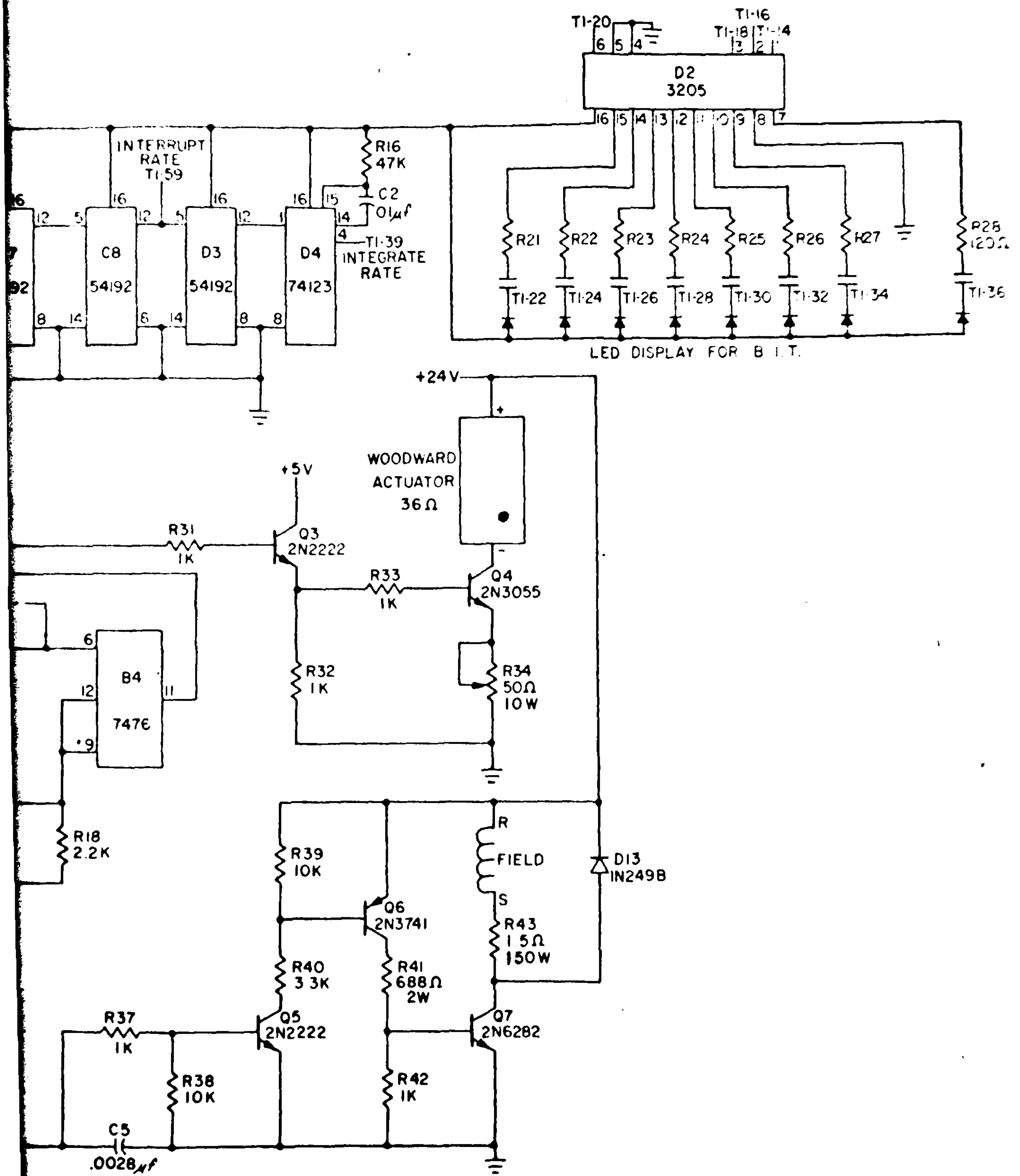
WOODWARD ACTUATOR DRIVER CIRCUIT



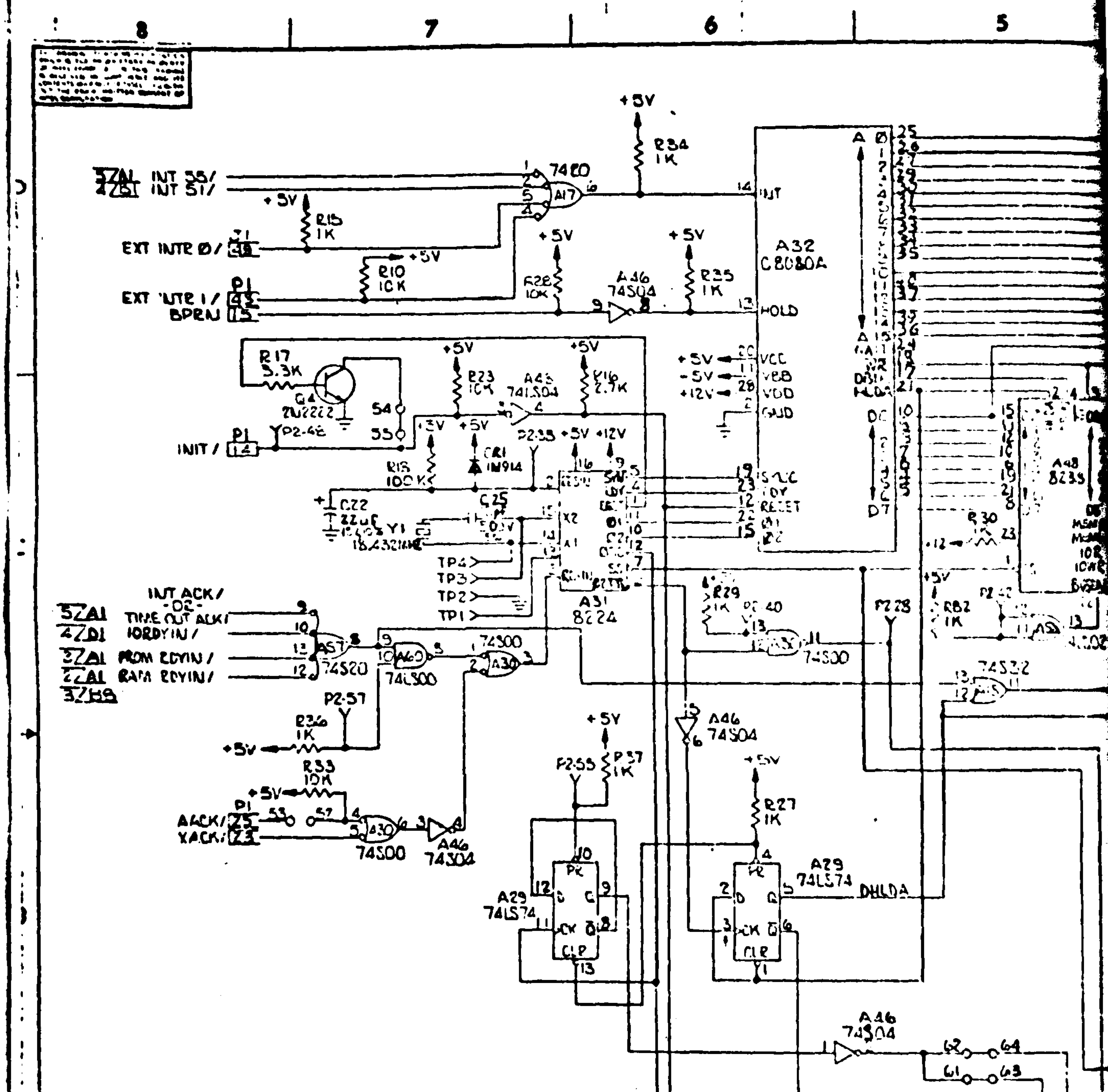
ØA
ØB
ØC
D8
D9
D10
R29
160.75K
C4
.33µf
R30
1.5K
T1-70
R2
2.5K
R5
2K
+12V
-12V
A3
741CJ
R3
15.2K
R1
5K
R4
183 Ω
-12V
D2
1N754
D1
1N4005
T1-41
A4
7402
A4
SW 1
SW 2
A5
AH0126
+12V
-12V
LF398 (SA
(PART OF
T1-33
-12V
C1
.1µf
+12V
R7
10K
ØA
D11
1N4001
D12
1N4001
R35
47K
T1-10
T1-12
-5V
C4
1711
+12V
B7
54S04
R12
1K
+5V
Q2
2N2222
D7
1N4001
R19
1K
C3
180ηf
R20
1K
-5V
B5
7476
+5V
A4
7402
T1-31
B5



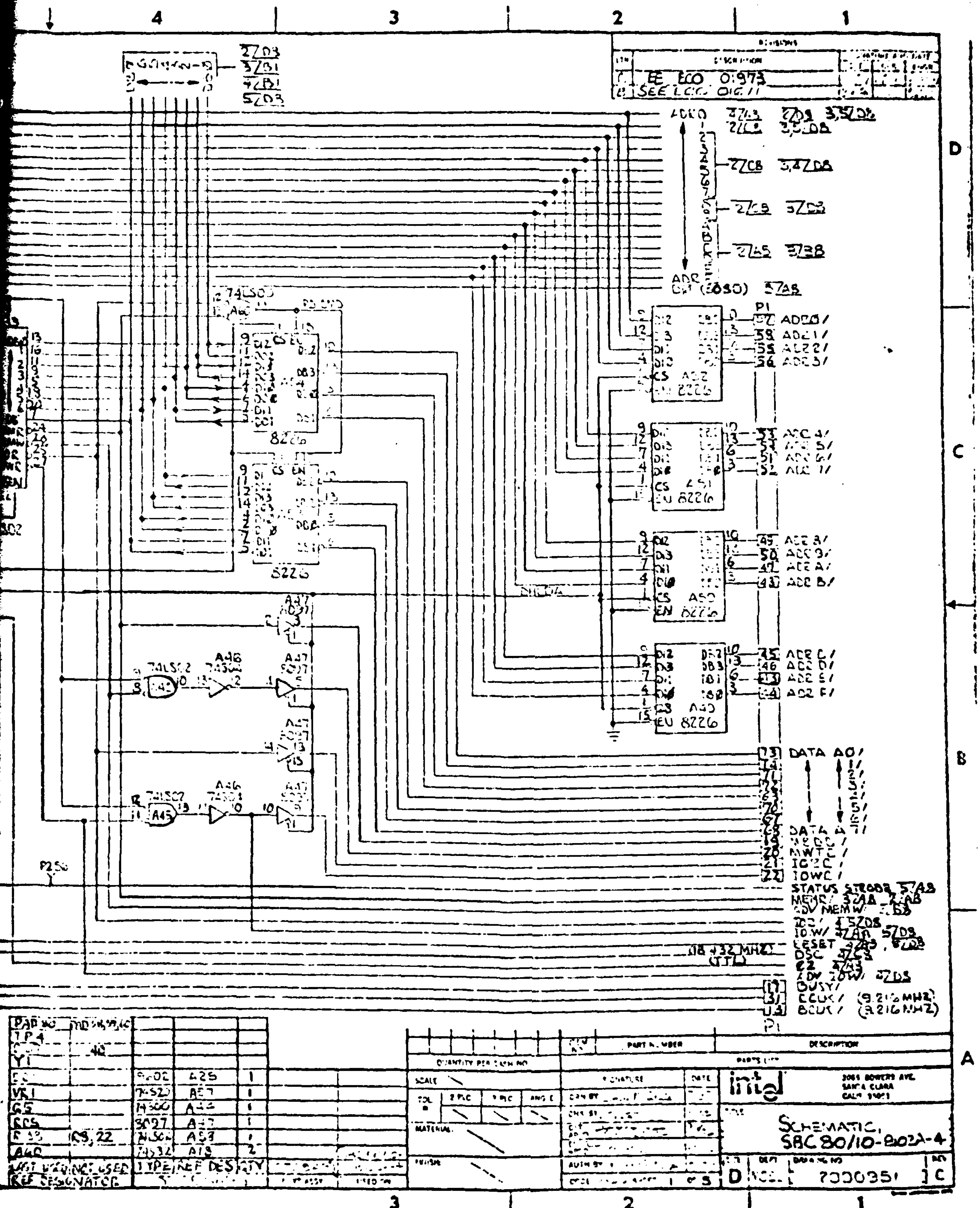
MICROCOMPUTER CONTROL BOARD

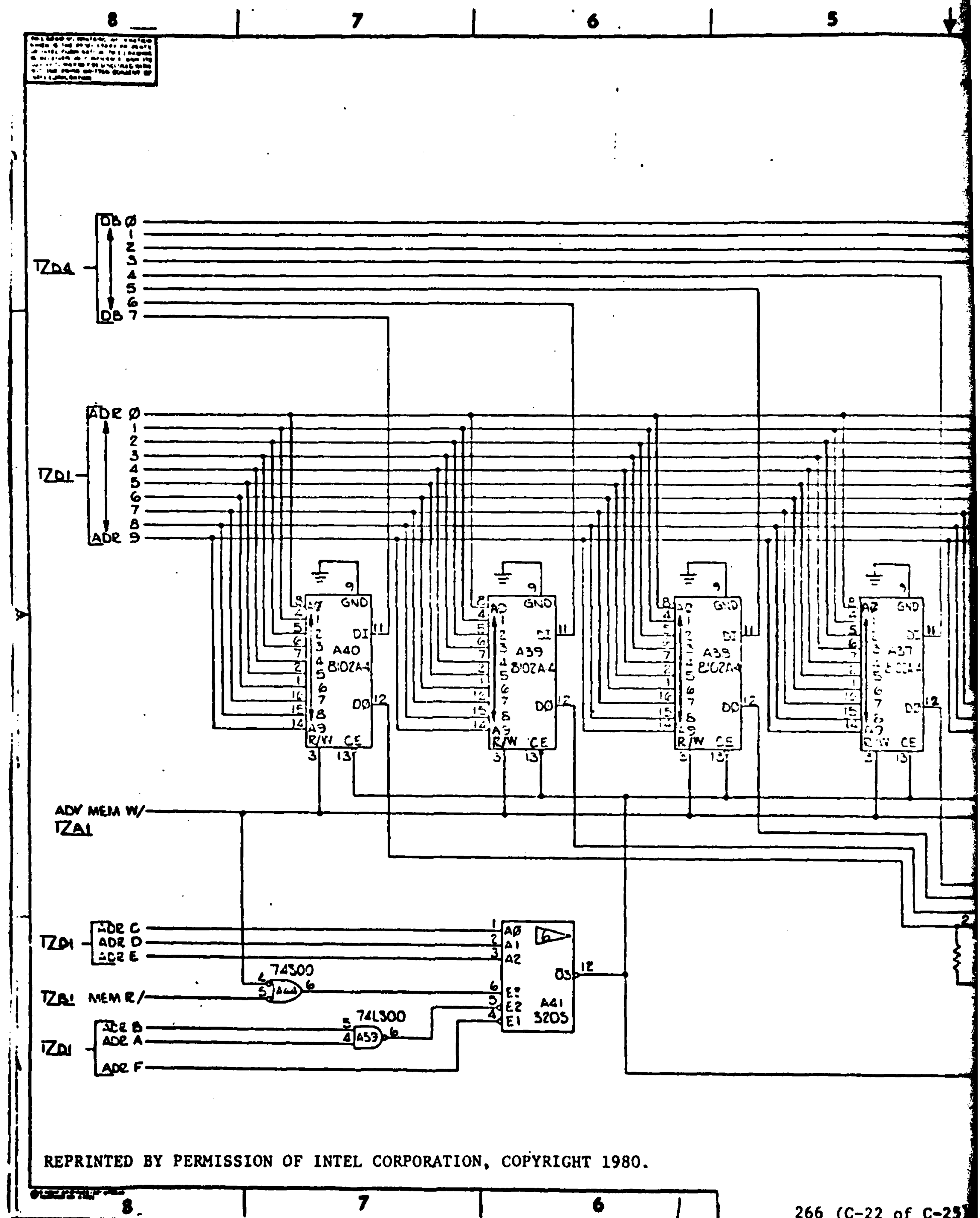

T1-20
T1-16
T1-18
T1-14
D2
3205
INTERRUPT
RATE
T1-59
R16
47K
C2
.01µf
T1-39
INTEGRATE
RATE
C8
54192
D3
54192
D4
74123
R21
R22
R23
R24
R25
R26
R27
R28
120Ω
T1-22
T1-24
T1-26
T1-28
T1-30
T1-32
T1-34
T1-36
LED DISPLAY FOR B.I.T.
+24V
WOODWARD
ACTUATOR
36Ω
+5V
R31
1K
Q3
2N2222
R33
1K
Q4
2N3055
B4
7476
R32
1K
R34
50Ω
10W
R18
2.2K
R39
10K
Q6
2N3741
R
FIELD
S
D13
IN249B
R43
1.5Ω
150W
R40
3.3K
R41
688Ω
2W
R37
1K
Q5
2N2222
Q7
2N6282
R38
10K
R42
1K
C5
.0028µf

B



NOTES: UNLESS OTHERWISE SPECIFIE
1. REMOVED
2. RESISTOR VALUES ARE IN OHMS, 1/4 W, ±5%.
3. CAPACITOR VALUES ARE IN MICROFARADS, 25V, +80 −20%.
4. ON J1 AND J2 EVEN PINS ARE GROUND.
5. AS THRU 1,21,23 THRU 26 ARE SHOWN FOR CLARITY, ACTUAL COMPONENTS ARE CUSTOMER INSTALLED.
6. A41, 42 & 14 MAY BE SUBSTITUTED WITH A 74LS138.


SCHEMATIC,
SBC 80/10-8102A-4
7000351
DATA A0/
DATA A7/
ADR0/
ADR1/
ADR2/
ADR3/
ADR4/
ADR5/
ADR6/
ADR7/
ADR8/
ADR9/
ADRA/
ADRB/
ADRC/
ADRD/
ADRE/
ADRF/
MRDC/
MWTC/
IORC/
IOWC/
STATUS STROBE
BUSY/
CCLK/
BCLK/
8226
74LS02
7404
8097
3001 BOWERS AVE.
SANTA CLARA
CALIF. 95051



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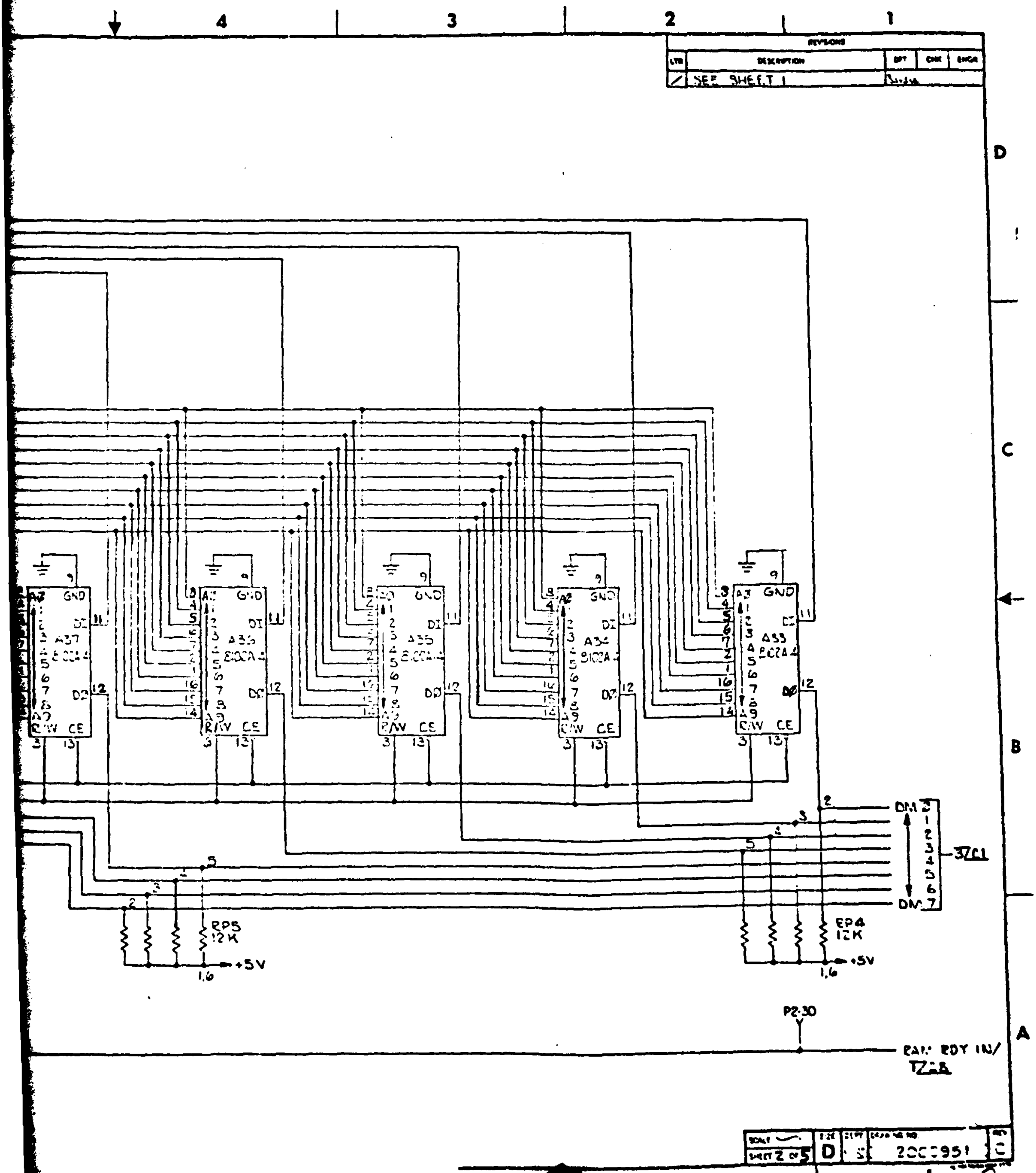
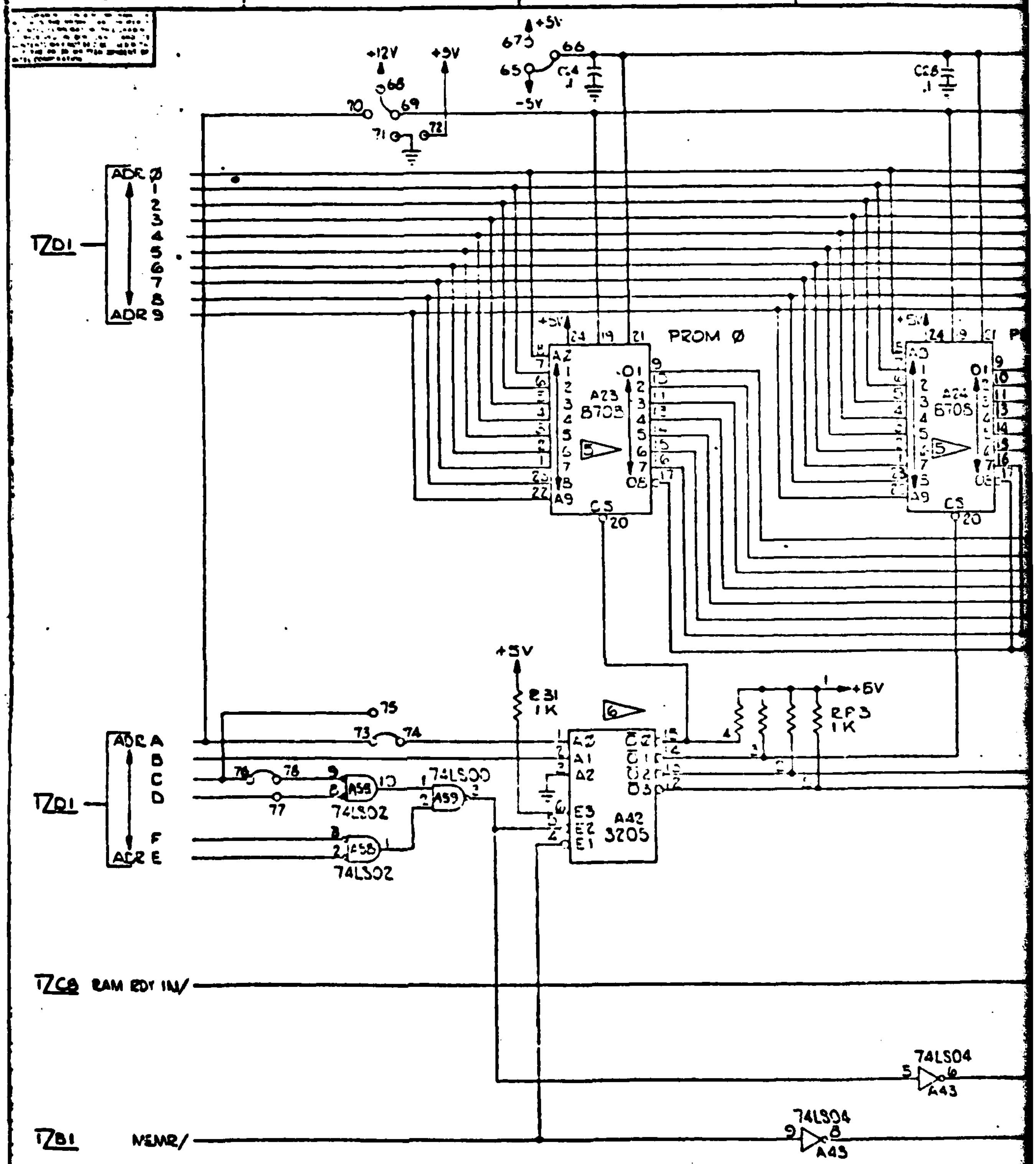


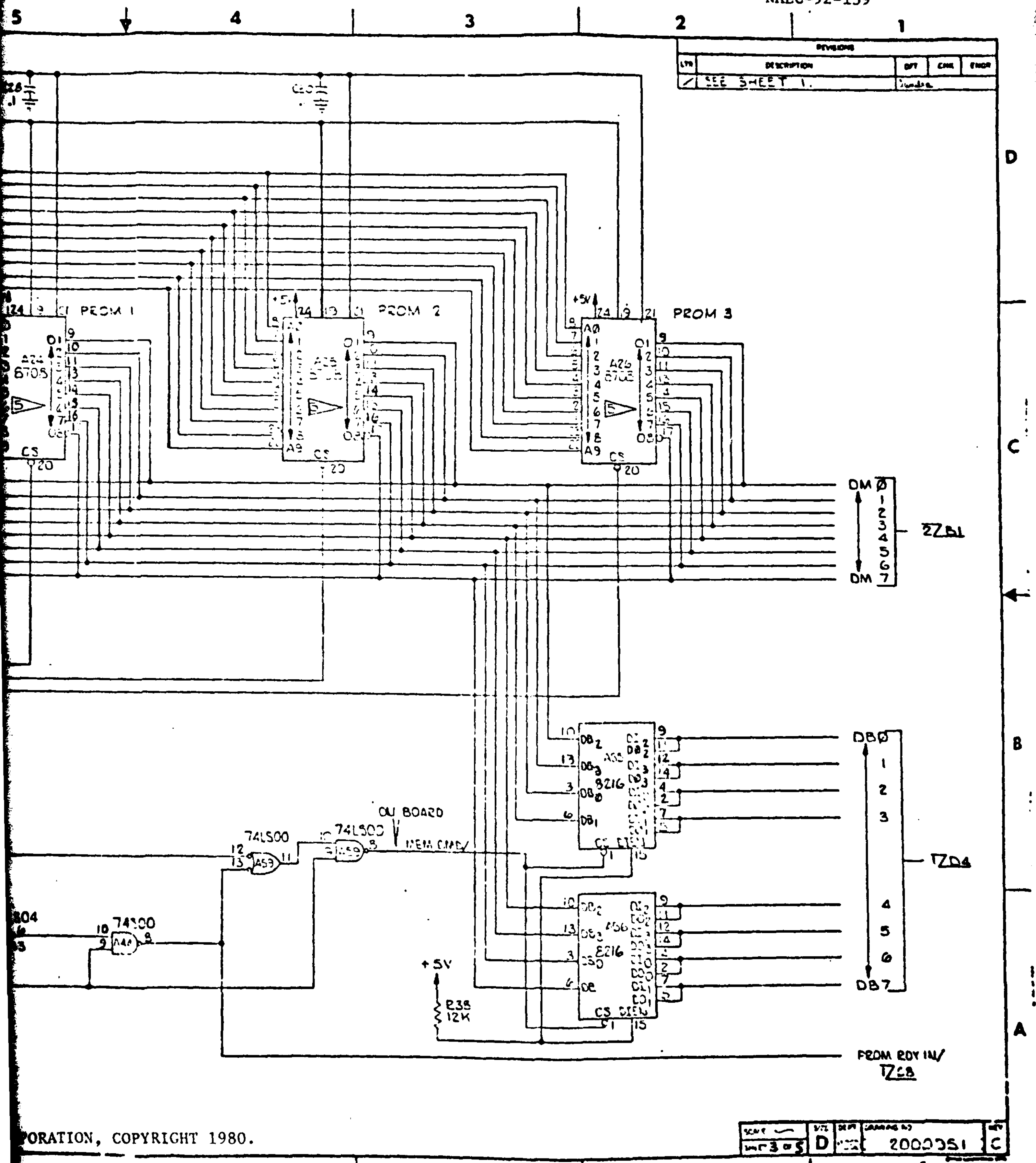
4
3
2
1
REVISIONS
LTR
DESCRIPTION
SEE SHEET 1
D
C
B
A
GND
DI
DO
CE
R/W
A37
A36
8102A4
A35
A34
A33
RP5
12K
RP4
12K
+5V
DM
37C1
P2-30
RAM RDY IN/
SHEET 2 OF 5
D

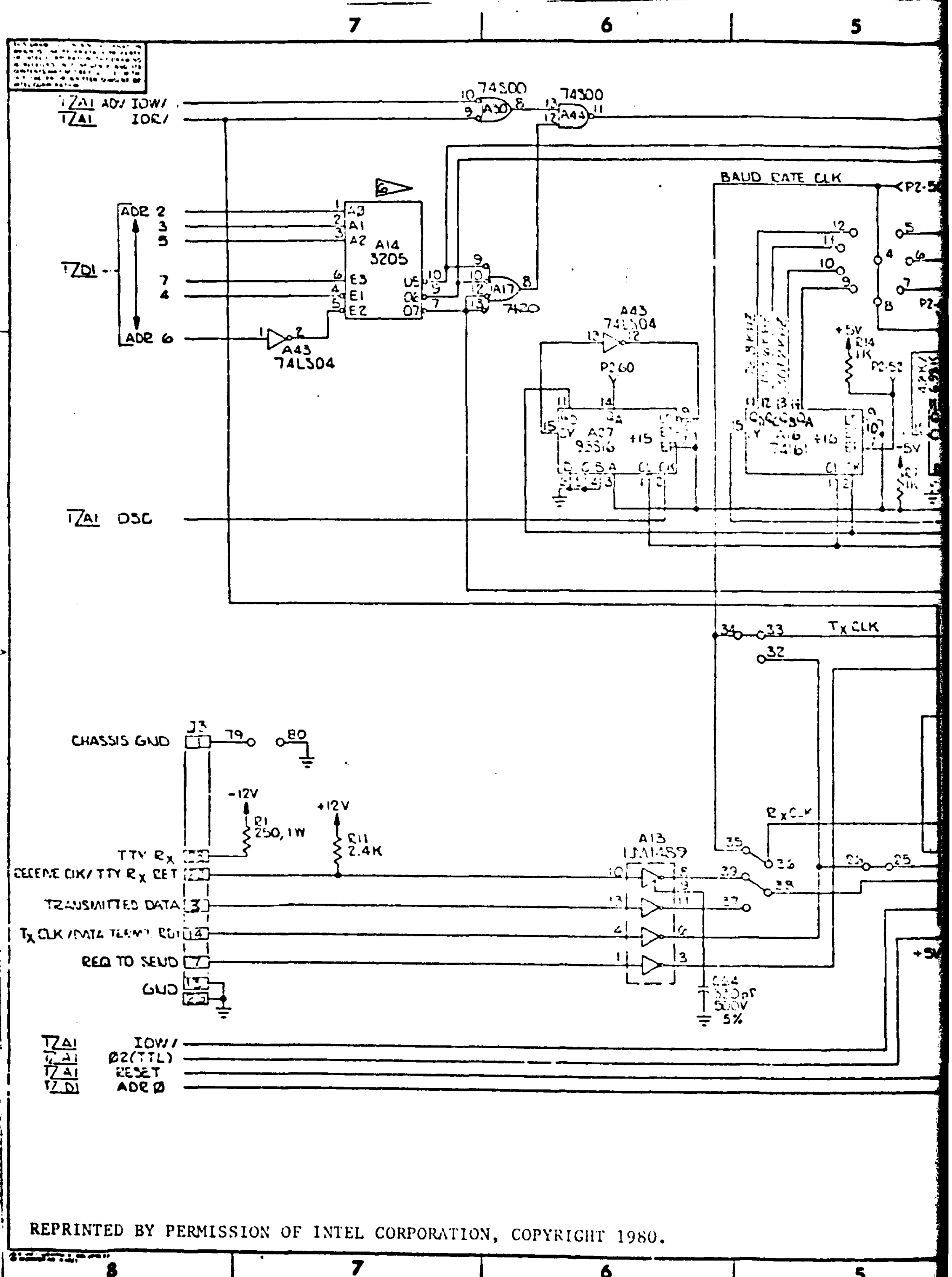


JUMPER TABLE			
2716 65-67	69-70	74-75	77-78
2708 65-66	68-69	73-74	76-78

	A23	A24	A25	A26
2716	0-7FF	[illegible]-17FF	800-FFF	1800-1FFF
2708	0-3FF	400-7FF	[illegible]-BFF	C00-FFF

8 7 6


PROM 1
PROM 2
PROM 3
A24
A25
A26
DM Ø
DM 7
ZZB1
DB Ø
DB 7
TZD4
8216
OU BOARD
MEM CMD/
74LS00
+5V
R38
12K
FROM RDY IN/
TZC8
SEE SHEET 1.
2000051



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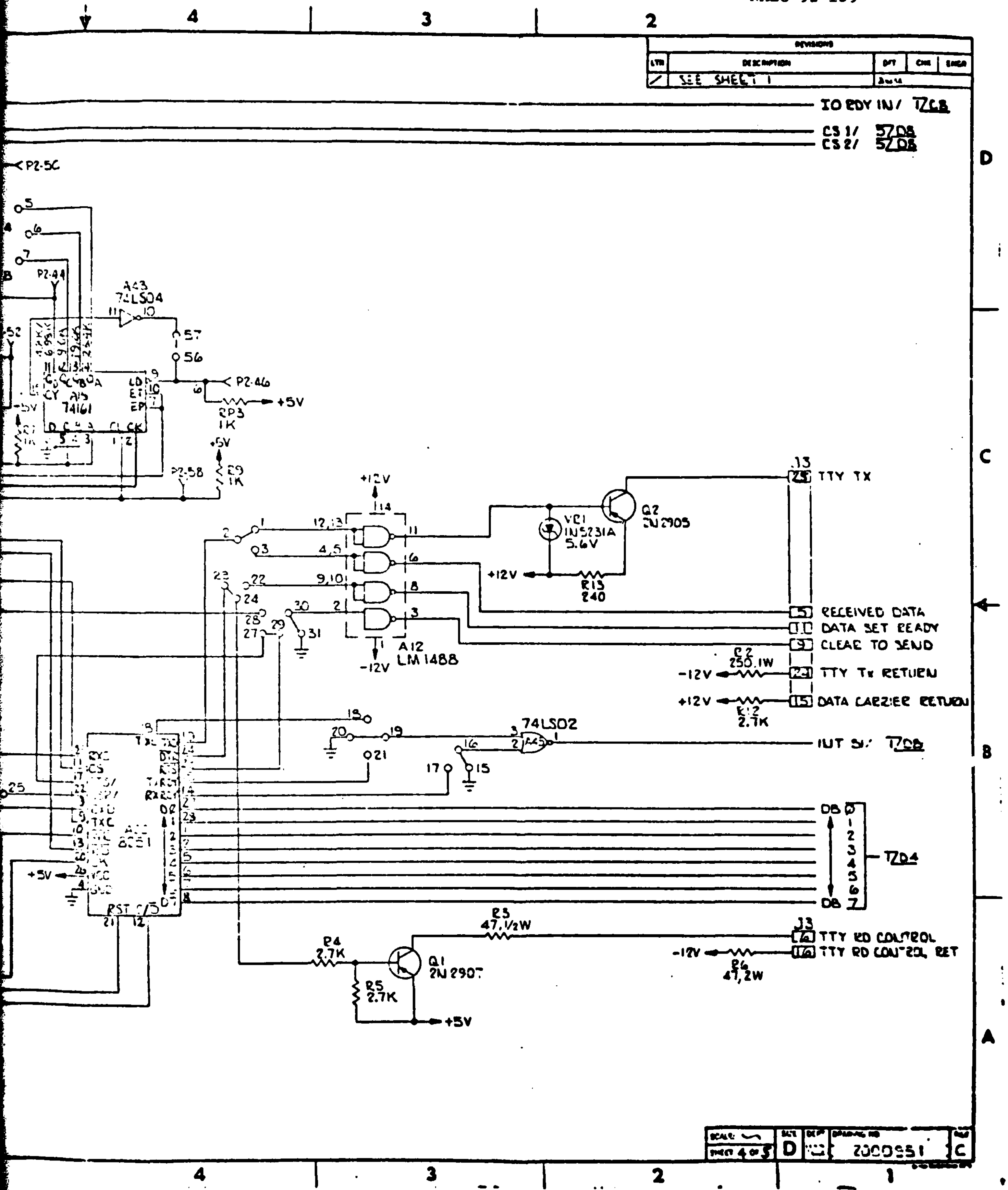
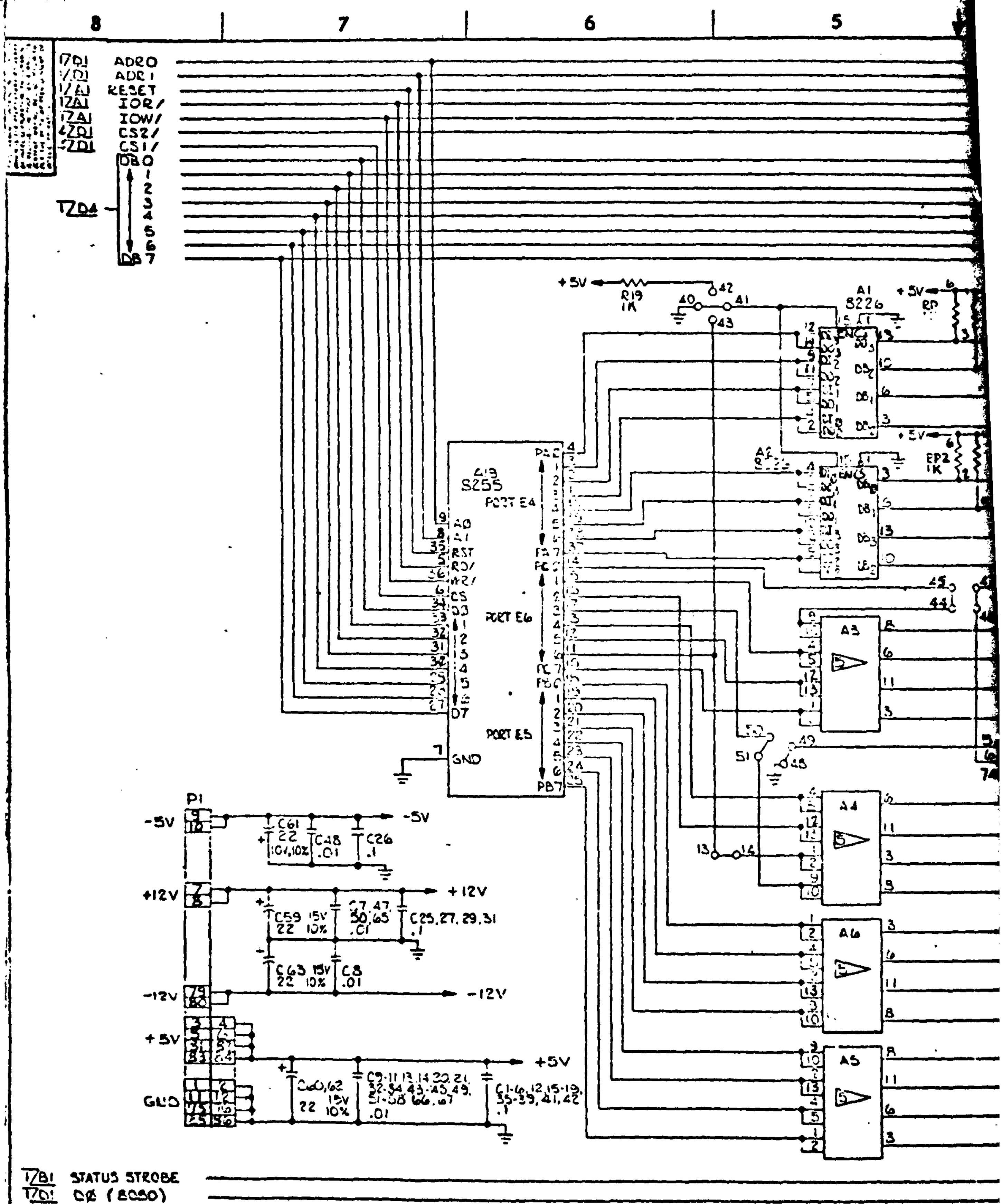
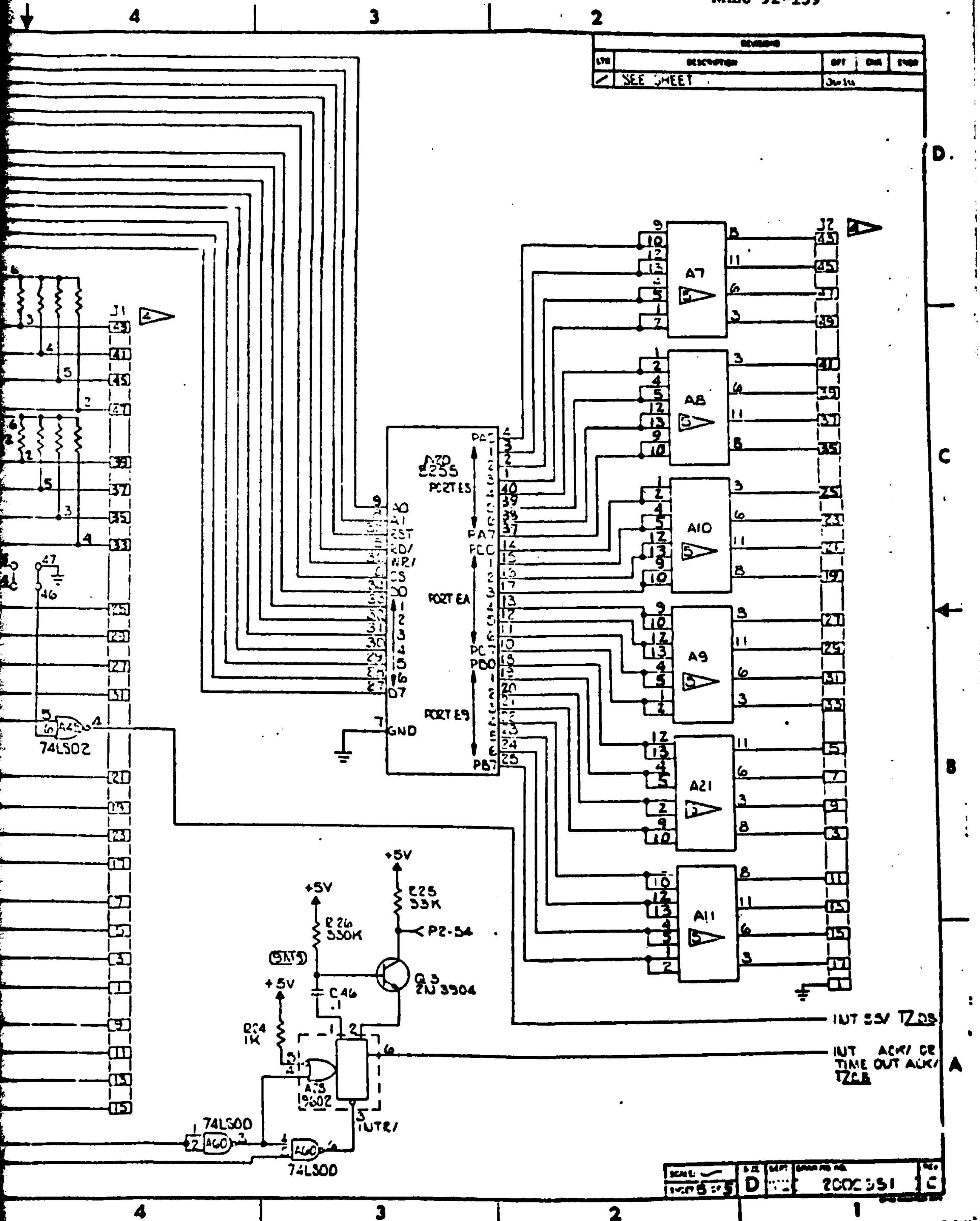


REVISIONS
LTR
DESCRIPTION
SEE SHEET 1
TO RDY IN/
CS 1/
CS 2/
A43
74LS04
A15
74161
2N2905
IN5231A
5.6V
R13
240
A12
LM1488
RECEIVED DATA
DATA SET READY
CLEAR TO SEND
TTY TX RETURN
DATA CARRIER RETURN
74LS02
TTY TX
TTY RD CONTROL
TTY RD CONTROL RET
2N2907
+12V
-12V
+5V
2000551


8
7
6
5
ADR0
ADR1
RESET
IOR/
IOW/
CS2/
CS1/
DB0
DB7
+5V
R19
1K
A1
8226
A3
A4
A5
A6
S255
PORT E4
PORT E6
PORT E5
GND
P1
-5V
+12V
-12V
+5V
GND
C61
C48
C26
C59
C63
C8
C25, 27, 29, 31
C9-11, 13, 14, 20, 21, 32-34, 43-45, 49, 51-58, 66, 67
C1-6, 12, 15-19, 35-39, 41, 42
STATUS STROBE
DØ (8080)



4
3
2
1
D.
C
B
A
SEE SHEET
J1
J2
A7
A8
A10
A9
A21
A11
A20
8255
PORT EA
PORT EB
PA7
PB0
PB7
D7
GND
74LS02
+5V
R25
33K
R26
330K
P2-34
Q3
2N3904
C46
.1
R24
1K
A23
9602
74LS00
INTR/
INT ACK/ OR
TIME OUT ACK/
D

of C-25)

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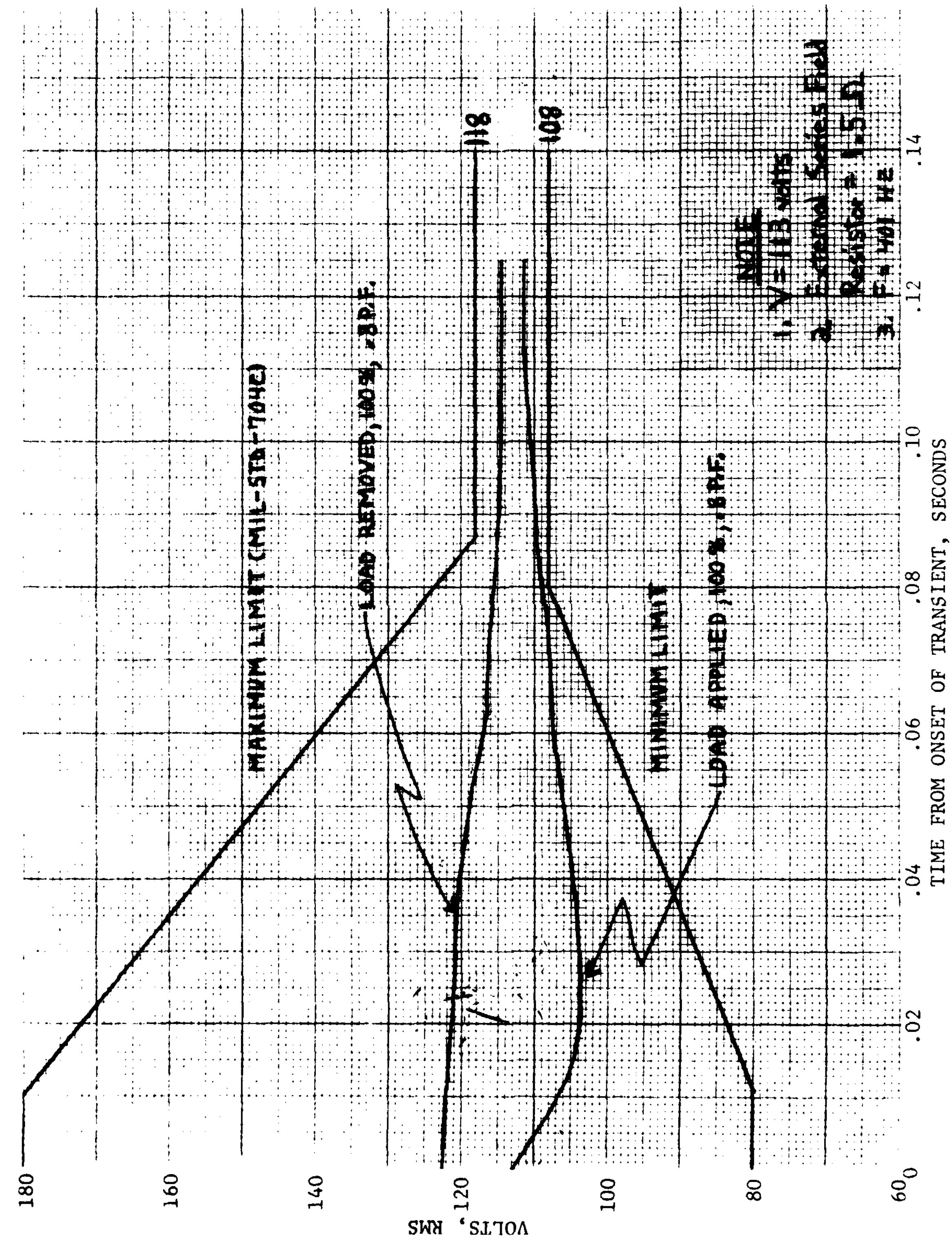
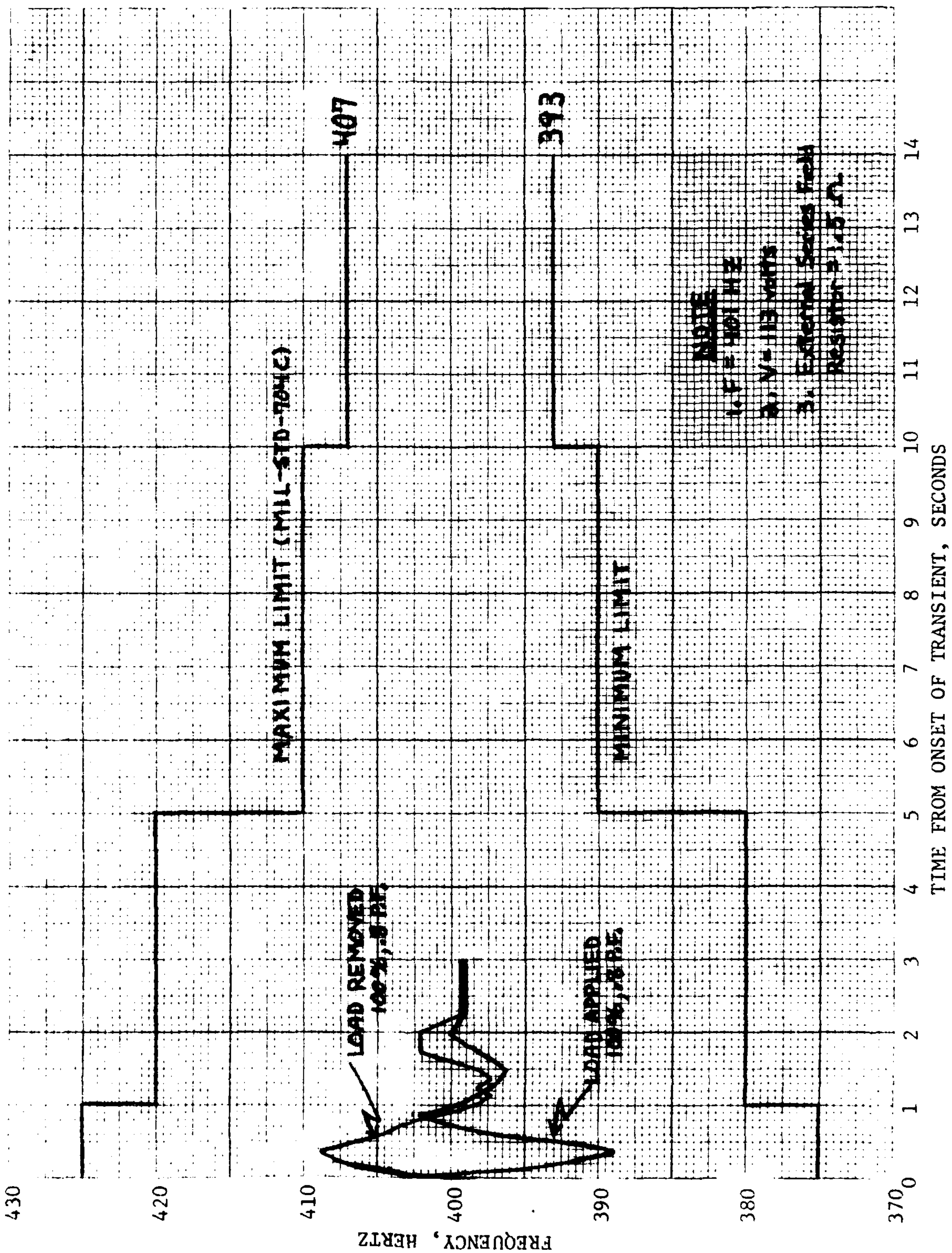
APPENDIX D

VOLTAGE AND FREQUENCY REGULATION RESULTS



VOLTAGE REGULATION RESULTS



FREQUENCY REGULATION RESULTS

AD-A085 990 NAVAL AIR ENGINEERING CENTER LAKEHURST NJ GROUND SUPP--ETC F/G 10/2
APPLICATION OF A MICROCOMPUTER TO A MOBILE ELECTRIC POWER PLANT--ETC(U)
MAY 80 R F O'DONNELL
UNCLASSIFIED NAEC-92-139 NL

4 OF 4
AD A085990

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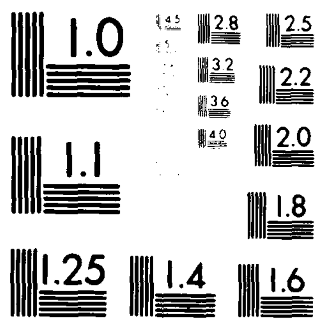

MICROCOPY RESOLUTION TEST CHART

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- 927
- 9271
- 92712 (5)
- 9272
- 92724 (10)
- 92A4

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